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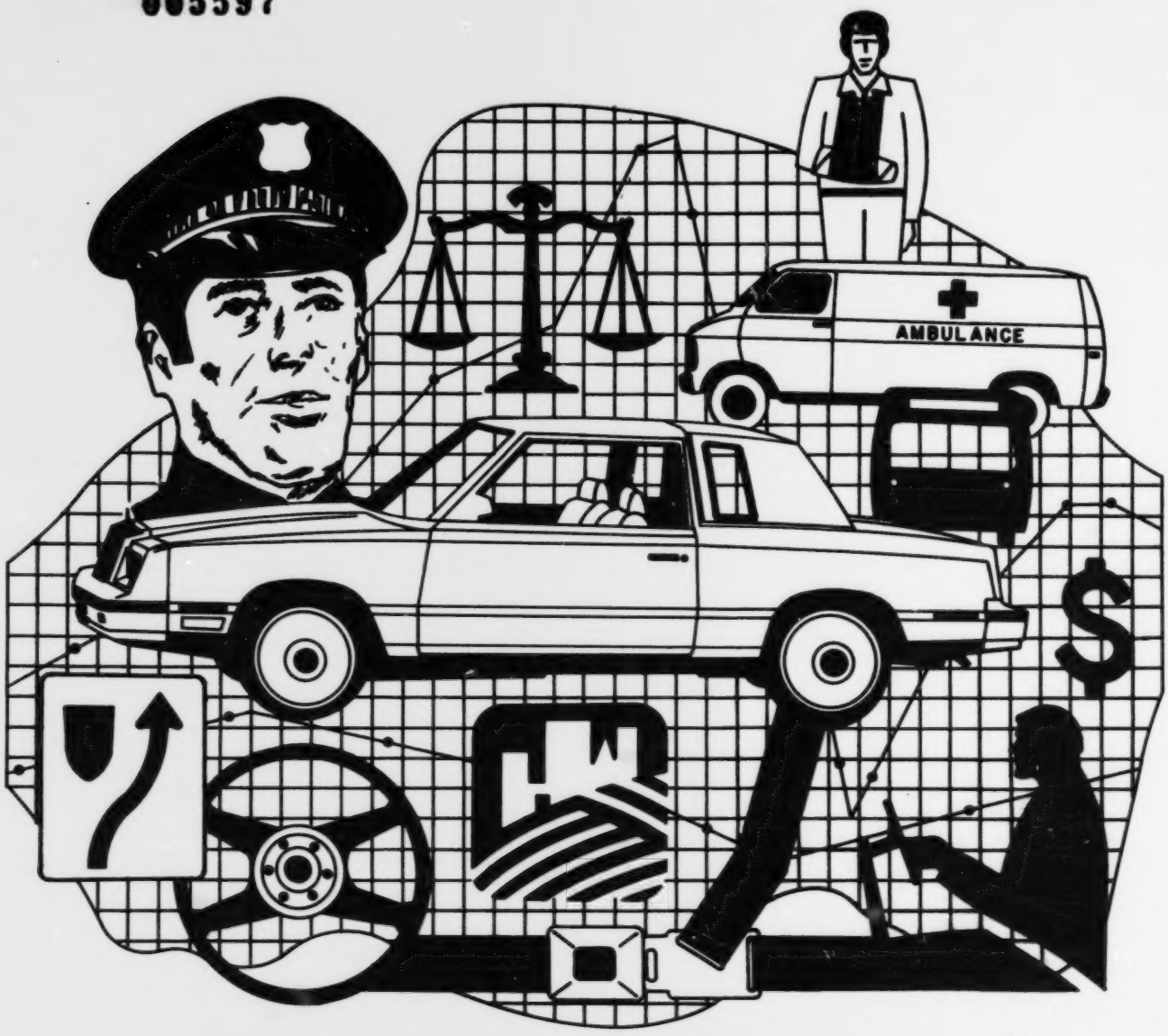

1981 HAMILTON-WENTWORTH COLLISION REPORT

PREPARED BY:
THE CITY OF HAMILTON TRAFFIC DEPARTMENT

1981 HAMILTON-WENTWORTH COLLISION REPORT

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1981 HAMILTON-WENTWORTH MOTOR VEHICLE COLLISION REPORT

Introduction

This annual report is a summary of factors associated with traffic collisions that occurred in the Regional Municipality of Hamilton-Wentworth in 1981.

Traffic collisions are a primary cause of accidental deaths (Appendix Exhibits A-1, A-2, and A-3), injuries and associated property losses. The intention of this report is to provide factual information to those agencies and persons concerned with the safety of the roadway transportation system within the Regional Municipality of Hamilton-Wentworth.

Traffic collisions frequently involve complex interactions between human behavior, vehicle characteristics, and the environment. The factor or factors responsible for causing a collision is not always the most obvious nor is it always readily apparent. Caution should be exercised if drawing conclusions from the statistics presented in this report and conclusions should be drawn only with appropriate qualifications and supportive information.

In 1981, the Hamilton-Wentworth Collision Report has been expanded to include several new exhibits. Two areas are emphasized, location of collisions and pedestrians. Exhibits 2-11 and 2-12 examine impact type versus road locations and traffic control. Exhibit 6-9 compares the location of collisions to the type of traffic control present. Exhibit 7-4 compares the collision rates for selected sub-groups of signalized intersections. Exhibits 4-3 and 4-8 review pedestrian action at traffic signals and relative differences in injuries for various pedestrian age groups.

1981 HAMILTON-WENTWORTH COLLISION REPORT

Summary:

* In 1981, 8,660 reportable traffic collisions occurred on municipal roadways in the Region of Hamilton-Wentworth. These collisions resulted in:-

- 21 driver or passenger fatalities (7 motor vehicle drivers, 1 motorcyclist, 1 bicyclist and 12 riders or passengers)
- 10 pedestrian fatalities
- 4,216 driver or passenger injuries
- 458 pedestrian injuries
- 24,833 persons or approximately 6 percent of the Regional population being involved in a reportable traffic collision in 1981
- over 15 million dollars in property damages (as estimated at the time of the collision)
- 42 million dollars (estimated) in damages when all collision costs including medical costs, loss of income and other related costs are taken into account

* Historical measurements of the average rates of collision involvement for the period from 1951 - 1981 were found to be as follows:-

- 27.0 collisions per 1,000 population per year with no trend indicated (21.3 for 1981)
- 0.09 deaths per 1,000 population per year with no trend indicated (0.08 for 1981)
- 10.1 injuries per 1,000 population per year with an upward trend indicated from 1951 to present, but a downward trend indicated from 1965 to present (12.3 for 1981)
- 1.7 pedestrian injuries per 1,000 population per year with a downward trend indicated (1.1 for 1981)

* The overall frequency of collisions in Hamilton-Wentworth is generally lower than other major Canadian municipalities.

* The overall frequency rates of fatalities in the City of Hamilton are generally lower than other Canadian cities and other U.S. cities of similar population.

* The period from 12 midnight to 5 a.m. exhibits the highest ratio of collisions to vehicle volume using the street system.

* The greatest causes of traffic collisions were driver or pedestrian error; either errors in judgement or perception, or non-observance of traffic regulations.

* The predominant improper driver actions indicated in collisions were "following too close" and "failure to yield right-of-way".

* Drivers under 20 years of age were involved in a disproportionate number of collisions relative to the number of drivers in this age group that are licenced to drive. This age group was involved in 13.4 percent of the reported collisions although it comprises only 7.2 percent of the licenced driving population.

* The additional expense incurred by persons involved in traffic collisions in the Region in 1981 which could have been prevented had they been wearing their seatbelts is estimated to be in the order of $350,000 dollars.

* Twelve percent of reported collisions involved one or more drivers who had been drinking.

* Alcohol was associated with a high proportion of collisions (39 percent) which occurred in the hours between 10 p.m. and 3 a.m. from Wednesdays to Sundays and in night-time collisions (27 percent of collisions between 6 p.m. and 6 a.m.).

Note: These figures are indicative of alcohol being present in the bloodstream of one or more of the drivers involved in the collision and do not necessarily suggest that alcohol was the proximate cause of the collision.

* Non-licenced drivers were less likely to be driving properly, and more likely to be under the influence of alcohol or drugs when involved in a collision.

* Motorcycle operators were more likely to be driving properly at the time of the collision and more likely to receive injuries if involved in a traffic collision.

* Children between 5 and 9 years of age were involved in a disproportionate number of pedestrian collisions (15.5%) compared with their proportion of the regional population (7.2%). Pedestrians in this age group were most frequently involved in a collision as the result of entering the roadway unexpectedly; that is, running into the roadway or entering the roadway from behind a parked vehicle or object.

* Vehicle defects were reported in less than 1 percent of the vehicles involved in collisions. It should be noted that the presence of a recorded vehicle defect does not necessarily suggest that it was the proximate cause of the collision.

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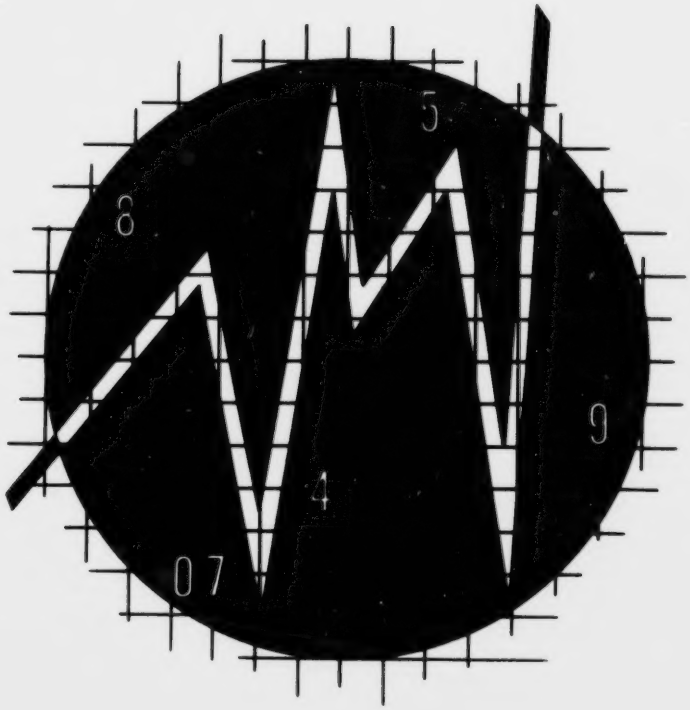


Chapter One
Trends

General

Since 1951, the number of motor vehicle collisions and persons injured in motor vehicle collisions in Hamilton and Hamilton-Wentworth has increased (Exhibits 1-4, 1-5, 1-6). However, in the same time period, the population of the reporting area has approximately doubled and motor vehicle registrations have risen by a factor of 3 (Appendix Exhibit A-4). There is also evidence to suggest that, with an improving highway system, each registered vehicle is driven a greater distance annually. The effect of increased population, vehicle registration and vehicle use is increased opportunity for motor vehicle collisions to occur.

Normalizing the Data

To fairly assess historical trends, collision data should be expressed in terms of rate (normalized) through the use of one of several factors. Annual motor vehicle use information would provide the most accurate assessment of a motorist's exposure, and hence, likelihood of involvement in a collision. However, this information is not available. Motor vehicle registration data has not been available for the Hamilton area since 1973. The lack of these data hampers the assessment of historical trends and limits the accuracy of future predictions.

Population is the only suitable normalizing factor presently available. Therefore, Exhibits 1-1, 1-2, 1-3 and associated analysis in this chapter refer to data which has been calculated on a population rate basis.

Collisions

The overall motor vehicle collision rate is shown in Exhibit 1-1. As of January 1, 1978, the reporting level for property damage only collisions was raised from $200.00 to $400.00. In 1981 the overall number of collisions was approximately 4 percent larger than in 1980.

Due to changes in the reporting criteria and reporting area for the period for which historical data are available, trend analysis of the number of collisions would not be appropriate or meaningful.

Personal injury collisions (Exhibit 1-1) show a significant (at the 99 percent level) decline from 1965 to 1981.

The results of this regression analysis and others in this chapter are included in Appendix Exhibit A-7.

Injuries

The personal injury rate graph (Exhibit 1-2), parallels the closely related injury collision graph (Exhibit 1-1). From 1951 to 1981 a significant increase in the personal injury rate is noted, while from 1963 to 1981 a slight decrease (although not statistically significant) is shown.

The rate of occurrence of pedestrian injuries (Exhibit 1-2) has demonstrated a modest but consistent decrease from 1951 to 1981.

Fatalities

In 1981, thirty-one persons died in motor vehicle collisions.

Since fatal collisions are rare events, small changes in the number of fatalities cause large fluctuations in the fatality rate (Exhibit 1-3). These fluctuations reduce the validity of statistical tests. Thus while the fatality rate for all collisions shows a slight downward trend, especially since 1968, this trend is not statistically significant. The overall fatality rate thus appears unchanged during the past 25 years. Comparable patterns are evident for Ontario and Canada (Appendix Exhibit A-5).

The fatality rate for pedestrians does display a reduction which is significant over the last 30 years.

Exhibit 1-1

TRAFFIC COLLISION RATES - 1951 TO DATE
PERSONAL INJURY COLLISION RATES - 1954 TO DATE

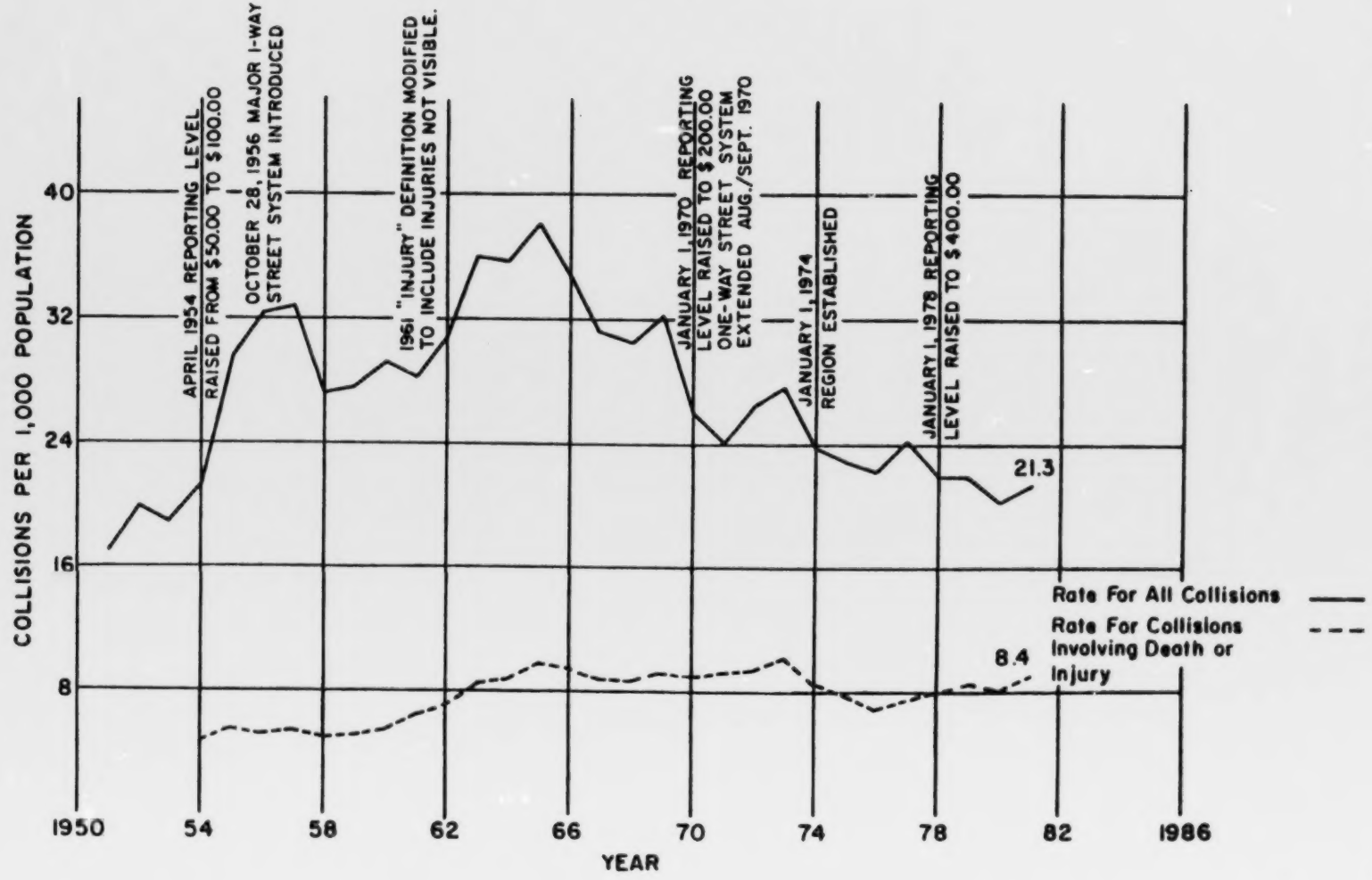


Exhibit 1-2

PERSONAL INJURY RATES IN TRAFFIC COLLISIONS
1951 TO DATE

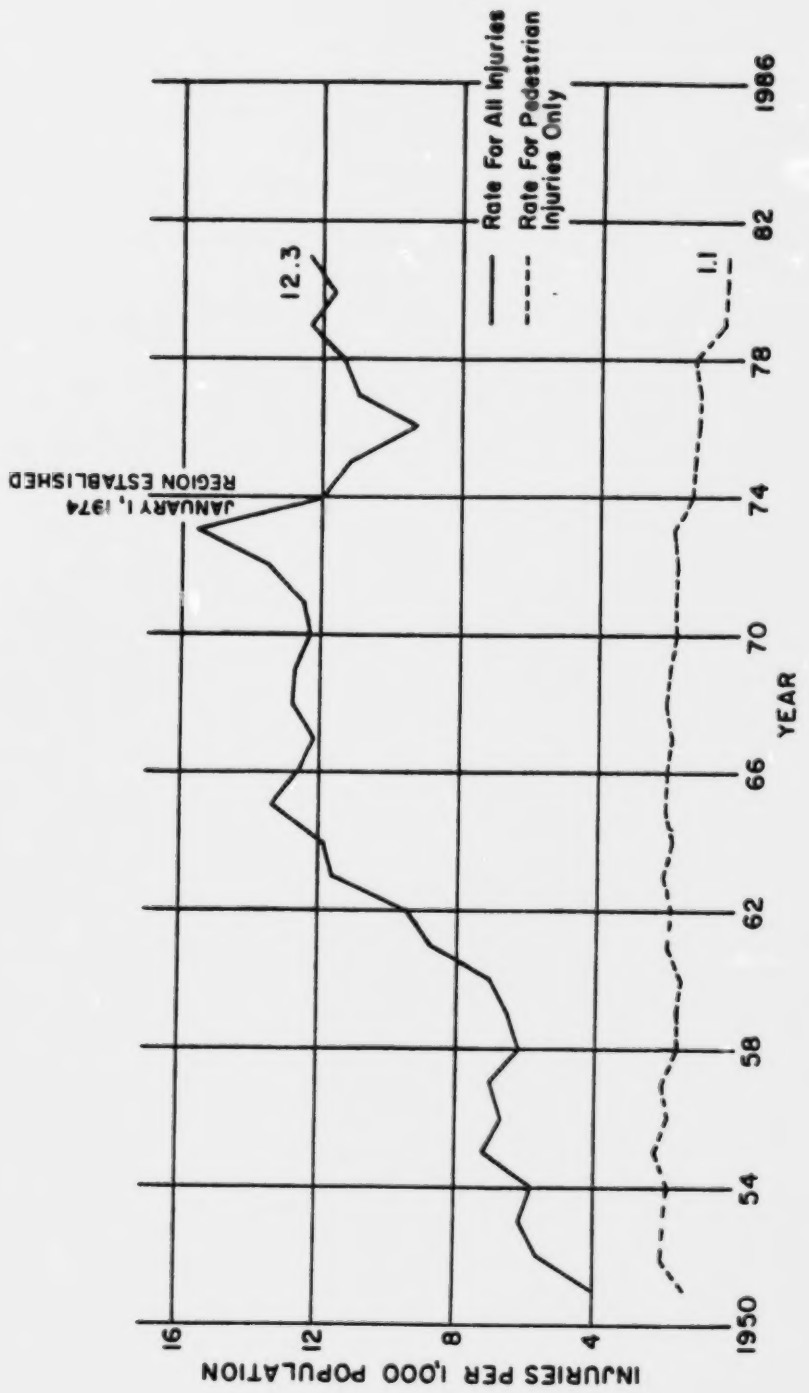


Exhibit 1-3

FATALITY RATES IN TRAFFIC COLLISIONS - 1951 TO DATE

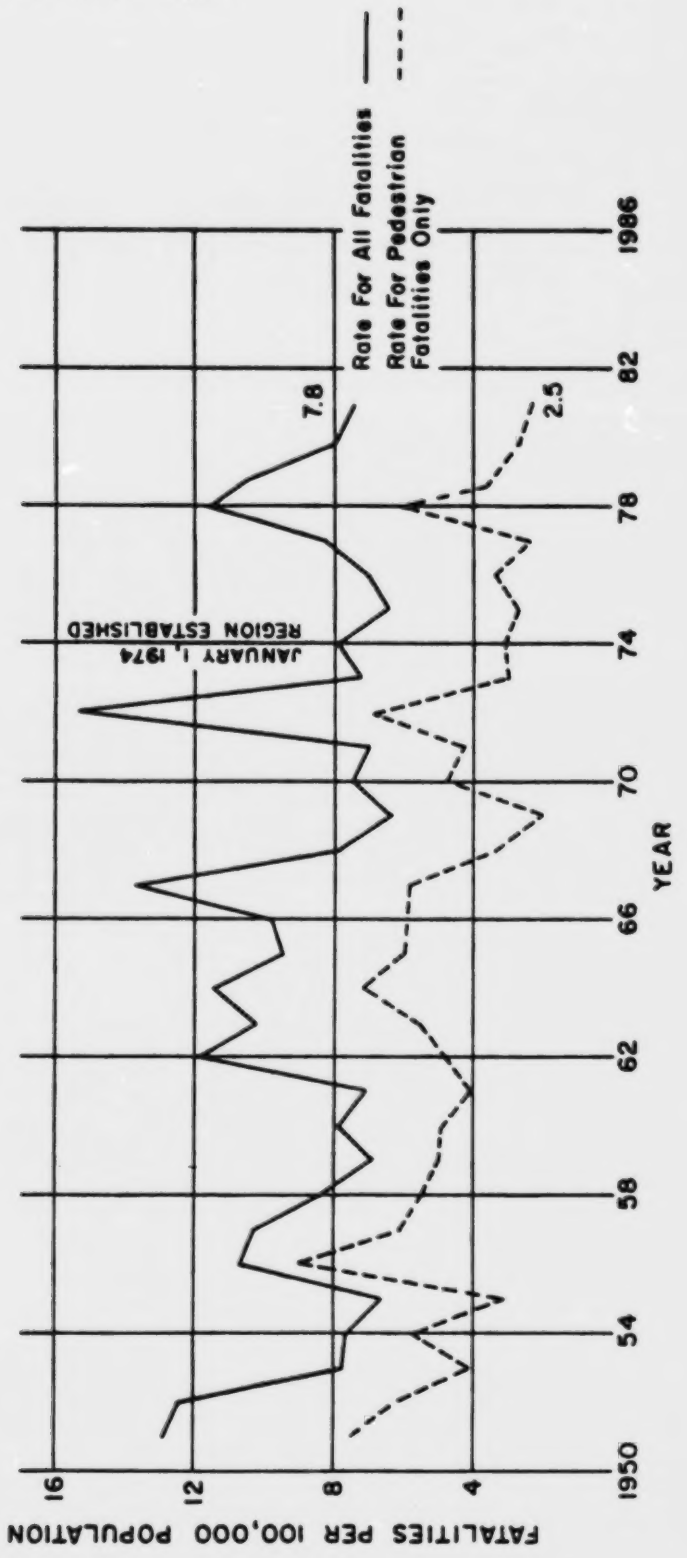


Exhibit 1-4

COLLISION STATISTICS - HISTORIC TRENDS

Year	Total No. of Collisions	Fatal Collisions	Injury Collisions	Property Damage Collisions	Estimated Total Property Damage ($)
1947	1,052	N/A	N/A	N/A	209,965
1948	1,351	N/A	N/A	N/A	312,170
1949	1,745	N/A	N/A	N/A	378,235
1950	2,304	N/A	N/A	N/A	522,535
1951	3,421	N/A	N/A	N/A	752,185
1952	4,219	N/A	N/A	N/A	892,329
1953	4,114	N/A	N/A	N/A	974,290
1954[a]	4,787	16	1,070	3,701	841,762
1955	6,691	13	1,297	5,381	1,014,339
1956	7,528	25	1,222	6,281	1,169,797
1957	7,973	25	1,376	6,572	1,382,399
1958	6,898	21	1,260	5,617	1,274,017
1959	7,189	18	1,337	5,834	1,388,015
1960	7,763	20	1,496	6,247	1,742,296
1961[a]	7,547	18	1,744	5,785	1,851,000
1962	8,338	28	1,904	6,406	2,160,000
1963	9,554	27	2,309	7,218	2,560,000

1964	9,948	32	2,455	7,461	2,886,000
1965	10,783	26	2,789	7,968	3,413,000
1966	9,950	27	2,757	7,166	3,521,000
1967	9,106	35	2,575	6,496	3,327,000
1968	8,983	21	2,547	6,415	4,449,000
1969	9,589	19	2,721	6,849	3,999,000
1970(a)	7,799	23	2,676	5,100	3,918,000
1971	7,314	22	2,821	4,471	4,647,000
1972	8,065	39	2,901	5,125	5,464,000
1973	8,499	23	3,143	5,333	6,208,000
1974(b)	9,599	29	3,364	6,206	7,886,000
1975	9,354	24	3,219	6,111	8,243,000
1976	9,146	28	2,816	6,302	9,262,000
1977	10,011	33	3,182	6,796	10,514,000
1978(a)	8,636	45	3,246	5,345	12,064,000
1979	8,798	39	3,389	5,370	13,325,000
1980	8,305	33	3,253	5,019	13,708,000
1981	8,660	28	3,398	5,234	15,536,040

(a) Collision reporting criteria changed (See Page 4).

(b) Reporting area expanded to include new areas patrolled by the Hamilton-Wentworth Regional Police.

Exhibit 1-5

PERSONAL INJURIES AND FATALITIES - HISTORIC TRENDS

Year	Total No. of Collisions	Persons Injured	Injury Rate/ 1,000 Pop.	Persons Killed	Death Rate/ 100,000 Pop.	Death Rate/ 10,000 Registered Vehicles
1947	1,052	563	N/A	26	N/A	N/A
1948	1,351	671	N/A	19	N/A	5.34
1949	1,745	738	N/A	29	N/A	N/A
1950	2,304	760	N/A	12	N/A	2.55
1951	3,421	815	4.0	26	12.9	5.13
1952	4,219	1,174	5.6	26	12.4	4.71
1953	4,114	1,322	6.1	17	7.8	2.84
1954[a]	4,787	1,304	5.8	17	7.6	2.71
1955	6,691	1,618	7.2	15	6.6	2.22
1956	7,528	1,570	6.7	25	10.7	3.57
1957	7,978	1,703	7.0	25	10.3	3.46
1958	6,898	1,573	6.2	21	8.4	2.77
1959	7,189	1,671	6.5	18	6.9	2.24
1960	7,763	1,871	7.1	21	7.9	2.54
1961[a]	7,547	2,311	8.7	19	7.1	2.22
1962	8,338	2,542	9.5	32	11.9	3.82
1963	9,554	3,075	11.6	27	10.2	3.03

1964	9,948	3,305	11.9	32	11.5	3.43	
1965	10,783	3,824	13.4	27	9.5	2.64	
1966	9,950	3,746	12.6	28	9.8	2.60	
1967	9,106	3,484	12.2	39	13.7	3.63	
1968	8,983	3,573	12.8	22	7.9	1.89	
1969	9,589	3,768	12.7	19	6.4	1.64	
1970(a)	6,759	3,717	12.3	23	7.5	2.00	
1971	7,314	3,876	12.5	23	7.0	1.91	
1972	8,065	4,055	13.5	46	15.3	3.42	(b)
1973	8,499	4,951	15.5	23	7.2	1.63	
1974(c)	9,599	4,678	11.9	31	7.9	2.00	(b)
1975	9,354	4,474	11.2	26	6.5	1.60	(b)
1976	9,146	3,811	9.3	29	7.1	1.78	(b)
1977	10,011	4,513	11.0	34	8.3	2.00	(b)
1978(a)	8,636	4,635	11.4	47	11.6	N/A	
1979	8,798	4,923	12.1	42	10.3	N/A	
1980	8,305	4,800	11.7	33	8.0	N/A	
1981	8,660	5,015	12.3	31	7.6	N/A	

(a) Collision reporting criteria changed (See Page 4).

(b) Registration estimated from total Ontario registrations.

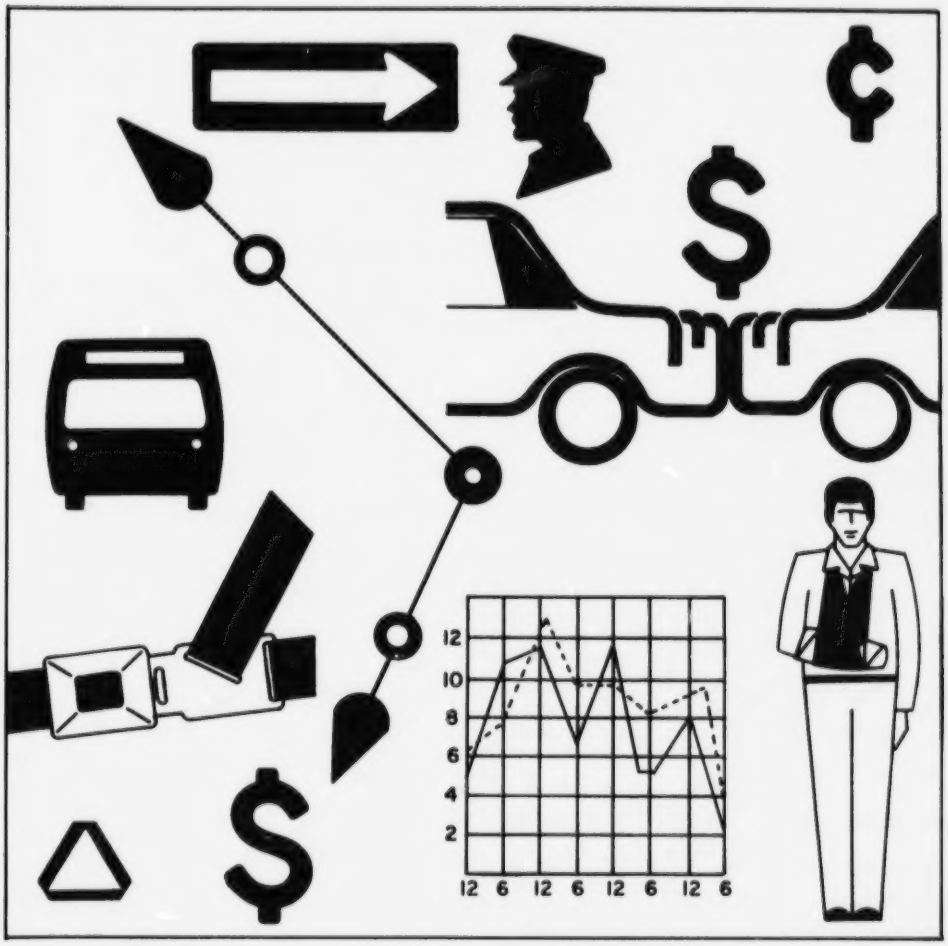
(c) Reporting area expanded to include new areas patrolled by the Hamilton-Wentworth Regional Police.

Exhibit 1-6

PEDESTRIAN AND CYCLIST INJURIES
HISTORIC TRENDS

YEAR	PEDESTRIAN		BICYCLIST	
	Injuries	Fatalities	Injuries	Fatalities
1947	141	21	N/A	N/A
1948	204	13	N/A	N/A
1949	271	18	43	-
1950	239	11	69	1
1951	284	15	89	-
1952	448	13	116	1
1953	464	9	113	1
1954	439	13	129	1
1955	517	7	141	1
1956	447	21	123	1
1957	526	15	124	2
1958	446	14	100	2
1959	456	13	120	1
1960	422	13	120	2
1961	522	11	112	1
1962	495	13	126	1
1963	558	15	120	1
1964	526	20	120	-
1965	582	17	140	-
1966	618	17	132	1
1967	537	17	113	-
1968	588	10	84	1
1969	602	6	91	2
1970	586	14	101	1
1971	570	13	155	2
1972	530	21	156	2
1973	569	9	197	1
1974(a)	555	13	192	3
1975	513	11	235	-
1976	480	14	195	-
1977	503	10	193	3
1978	542	25	162	1
1979	464	15	177	4
1980	434	12	178	1
1981	458	10	159	1

(a) Reporting area expanded to include new areas patrolled by the Hamilton-Wentworth Regional Police.



Chapter Two
Selected Characteristics

Injuries

Of the 24,833 persons involved in collisions, 5,046 received injuries. The chance of an involved person sustaining an injury in a collision varied from a 17 percent chance for a motor vehicle rider or passenger to a 100 percent chance for a pedestrian (Exhibit 2-1). Although the risk of injury would appear to be significantly higher for motorcyclists, bicyclists and pedestrians, this phenomenum is partially or wholly explained by the reporting criteria. It is unlikely that a cyclist or pedestrian would be involved in a collision that resulted in over $400.00 damage without the cyclist or pedestrian being injured. Small or exposed vehicles such as bicycles also afford less protection in a collision.

Seatbelts

Although motor vehicle seatbelts were reported as being in use for over 90 percent of involved drivers (Exhibit 2-2), field observations taken by the Province of Ontario in 1978 (2.1) suggest an actual usage rate for drivers in the order of 65 percent. This discrepancy could be interpreted to mean that a higher proportion of seatbelt users were involved in collisions, but is more likely to indicate an over-statement of seatbelt usage by persons involved in collisions. The involved individual may be concerned about receiving a summons for failure to wear his or her seatbelt or may be concerned about additional financial or civil responsibilities caused by failure to wear belts at the time of the collision.

It is estimated that in Hamilton-Wentworth in 1981, 1,650 persons would have received less severe injuries had they been wearing their seatbelts. Ontario statistics (2.2) indicate increased medical and hospital costs for unbelted persons involved in collisions. If applied to Hamilton-Wentworth in 1981, unbelted persons involved in collisions would have been responsible for extra costs of $350,000.00. These costs do not include injuries that may have been entirely prevented had seatbelts been worn.

Motorcycle Injuries

Eighty-five percent of motorcyclists involved in collisions received injuries, compared to 21 percent of all persons involved in collisions. This is indicative of the limited protection afforded to motorcycle riders involved in a collision.

Seventy-one of 213 (33%) motorcyclists involved in collisions were reported as not wearing helmets, despite the Provincial law mandating helmet use (Exhibit 2-3).

Motorcycle Injuries (Cont'd)

Helmet use did not appear to have an effect on the likelihood of a motorcyclist being injured in a collision. Helmets are intended to prevent head injury, but in a serious collision, the motorcycle rider is equally likely to receive injuries to other parts of the body.

Damages

Total damages in collisions in Hamilton-Wentworth amounted to a sum in excess of 15 million dollars (Exhibit 2-4), which includes damage to vehicles and property but does not include medical and hospital expenses, loss of income, or loss of future earnings. The estimated cost of property damage of each collision was $1,794 with 52 percent of the vehicles involved sustaining damage in excess of $600 (Exhibit 2-5). When the costs of medical attention, lost income and other effects are considered, the total cost of each collision may exceed $6,500.

Times of Occurrence

A close similarity between the occurrence of collisions and traffic volumes, on a time of day basis (Exhibit 2-6), was observed. However, the collision rate (in terms of traffic volume) was greater than the daily average during the period from midnight to 5 a.m., when 982 or 11.3 percent of the collisions occurred.

The pattern of collision occurrences by time of day and day of week was summarized (Exhibit 2-7 and Exhibit 2-8), and distinct differences were found in the pattern of collision occurrence.

The explanation for variations in patterns of collisions by time of day and day of week may be associated with difference in travel patterns which change during the week due to the frequency of shopping or personal trips, or with psychological factors such as different drinking and stress patterns that might influence collision involvement.

The pattern of collision occurrences was compared on a month of year basis (Exhibit 2-9) and there was a difference between the number of collisions which occurred each month. The higher number of collisions occurring during the winter months is probably primarily due to drivers not adjusting to adverse weather and roadway conditions.

Impact Types

The type of initial impact was compared with the injury classification of the collisions (Exhibit 2-10) and it was determined (at the 95 percent level) that the probability of injury was not the same for all initial impact types.

The chance of being injured in an approaching or single motor vehicle collision was 52 to 54 percent compared to a 23 to 46 percent chance for other collision types. However, fewer approaching and single motor vehicle collisions resulted in injuries or fatalities (877 versus 2,549) than other collision types.

Greater than one half of all collisions were in intersections or associated with intersections (Exhibit 2-11). Twenty-eight percent of collisions occurred at signalized intersections, and 19 percent at stop- or yield-controlled intersections (Exhibit 2-12).

Over one half of all collisions occurred at locations with no form of traffic control.

REFERENCES

2.1 Based on surveys conducted by the Ministry of Transportation and Communications of Ontario, July 1978.

2.2 Ontario Ministry of Health: The cost of hospital and medical treatment for a person injured while wearing seatbelts is $282; for those not wearing belts, $419.

Exhibit 2-1 **INJURY STATUS OF ALL PERSONS INVOLVED**

Category	Persons Involved	Persons Injured	Injuries/ Involved	TYPE OF INJURY Fatal	Major	Minor	Minimal
Driver	14,561	2,626	0.18	7	180	960	1,479
Motorcyclist(a)	213	183	0.86	1	35	84	63
Bicyclist	163	160	0.98	1	10	69	80
Rider/Passenger	9,428	1,609	0.17	12	103	553	941
Pedestrian	468	468	1.00	10	84	216	158
Totals	24,833	5,046	0.20	31	412	1,882	2,721

THERE WERE 2 CHANCES IN 10 THAT A PERSON INVOLVED IN A TRAFFIC COLLISION WOULD BE INJURED.

(a) Motorcycle drivers only.

Exhibit 2-2

DRIVER INJURY STATUS VS SAFETY EQUIPMENT IN USE

Driver Injury Status	SAFETY EQUIPMENT IN USE				
	All	Pelvic Only	None	Unknown	Total
None	10,527	484	542	468	12,021
Minimal	1,271	55	118	48	1,492
Minor	746	28	125	68	967
Major	101	4	28	47	180
Fatal	1	-	2	4	7
Total	12,646	571	815	635	14,667

DRIVERS WHOSE SEAT BELT USAGE WAS RECORDED	14,667
TOTAL DRIVERS WEARING PELVIC AND/OR SHOULDER BELTS	13,217
RECORDED DRIVER BELT USAGE	90.1%

THE REPORTED SEAT BELT USAGE RATE FOR DRIVERS INVOLVED IN COLLISIONS WAS 90.1%

Exhibit 2-3

MOTORCYCLE INJURIES

Helmet in Use

Injury	Yes		(a)	No	Not Known	Total
None	14	(45.2)		15	1	31
Minimal	42	(66.7)		19	2	63
Minor	54	(64.3)		28	2	84
Major	24	(68.6)		9	2	35
Fatal	1	(100.0)		-	-	1
Totals	135	(63.4)		71	7	213

85% OF MOTORCYCLISTS INVOLVED IN COLLISIONS FOR WHICH INJURY STATUS WAS RECORDED RECEIVED INJURIES. THE LIKELIHOOD OF INJURY WAS SIMILAR FOR HELMET USERS AND NON USERS (HELMETS OFFER PROTECTION ONLY FOR HEAD AND NECK INJURIES).

33% OF MOTORCYCLISTS INVOLVED IN COLLISIONS WERE RECORDED AS NOT WEARING SAFETY HELMETS.

(a) Numbers in brackets are percentages of row totals.

Exhibit 2-4 **PROPERTY DAMAGE ESTIMATES (a)**

	Total	Average per Collision
Damage to Vehicles	$14,851,900.	$1,715.
Damage to Other Property	684,140.	79.
All Damage	15,536,040.	1,794.

THE AVERAGE DAMAGE FOR EACH REPORTED COLLISION WAS $1,794.

Exhibit 2-5 **ESTIMATED DAMAGE TO MOTOR VEHICLES (a)**

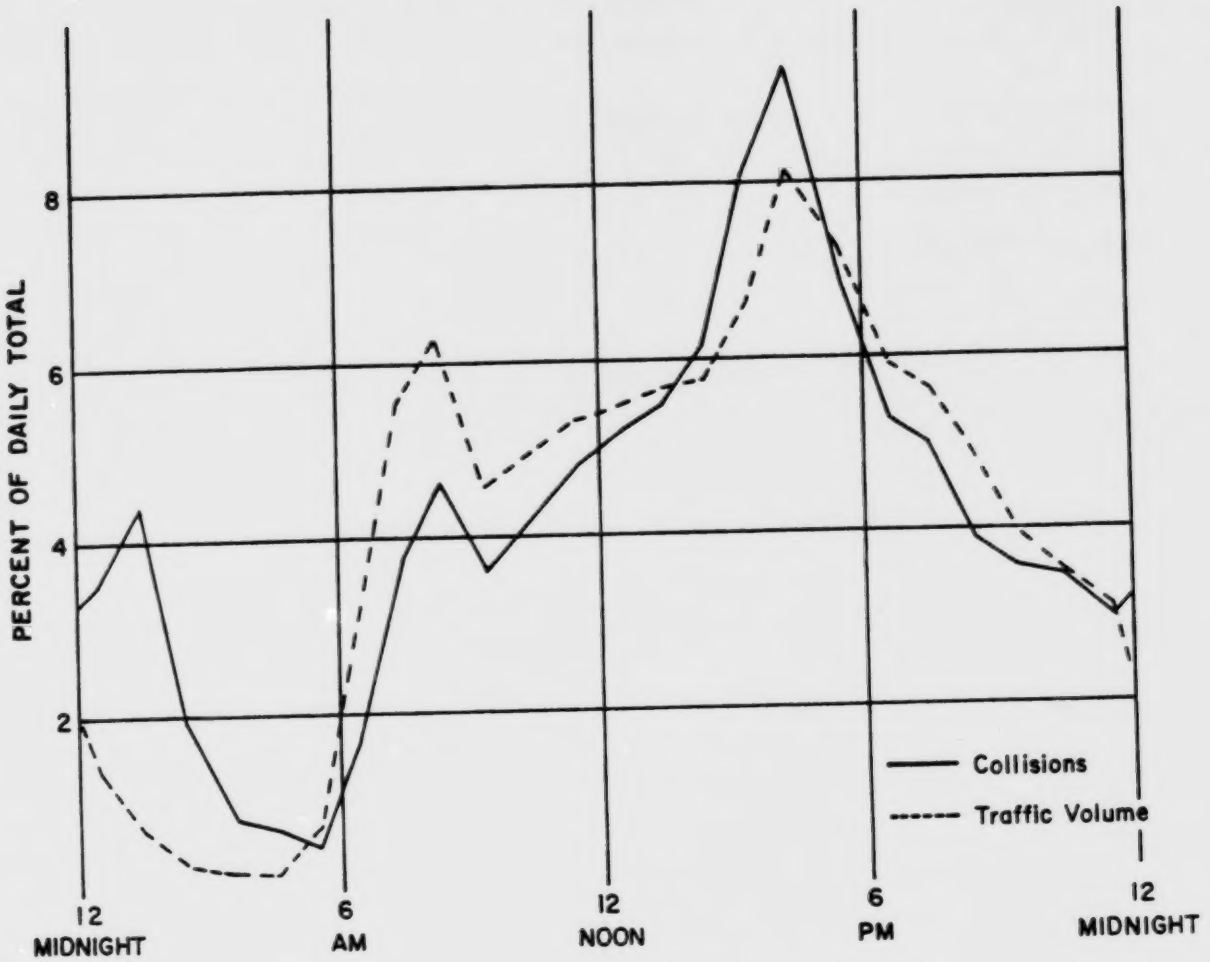
Damage	No. of Vehicles	% Of All Vehicles Involved
None	1,704	10.3
$0 - 199	1,530	9.2
$200 - 399	2,072	12.5
$400 - 599	2,633	15.9
$600 - 999	3,051	18.4
$1,000 - 1,999	3,301	20.0
$2,000 - 3,999	1,846	11.2
$4,000 and over	404	2.4
	16,541	100.0

OVER 52% OF THE VEHICLES INVOLVED IN COLLISIONS EXPERIENCED DAMAGE IN EXCESS OF $600.

(a) As estimated at the scene of the collision.

Exhibit 2-6

TIME OF DAY VS COLLISIONS AND TRAFFIC VOLUME



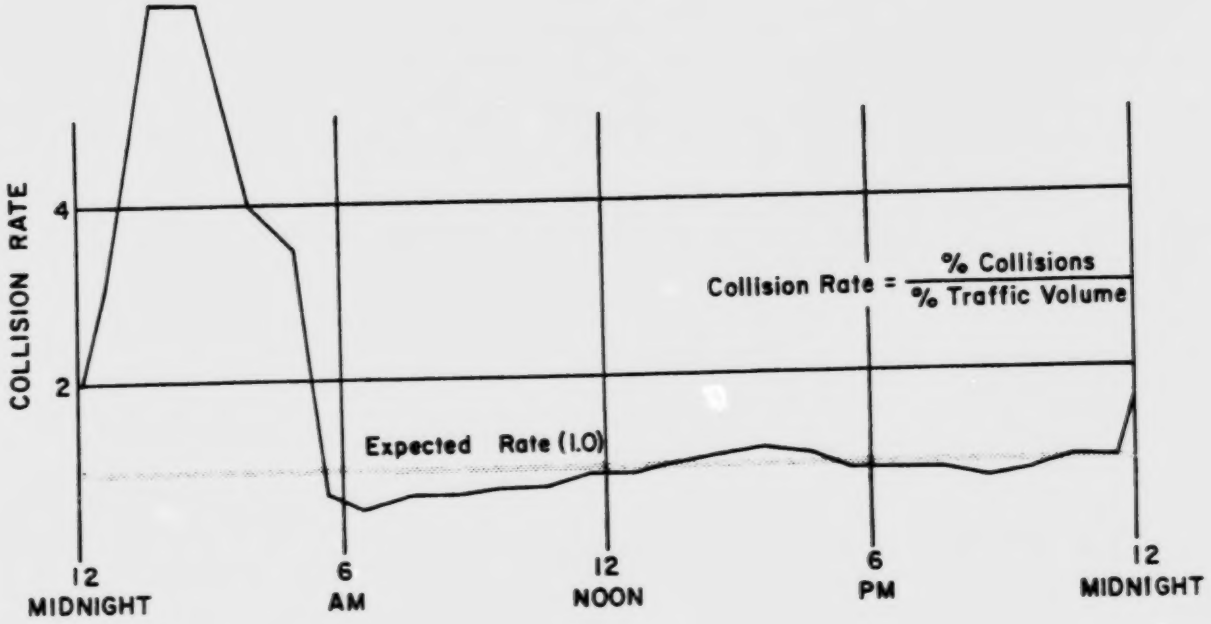


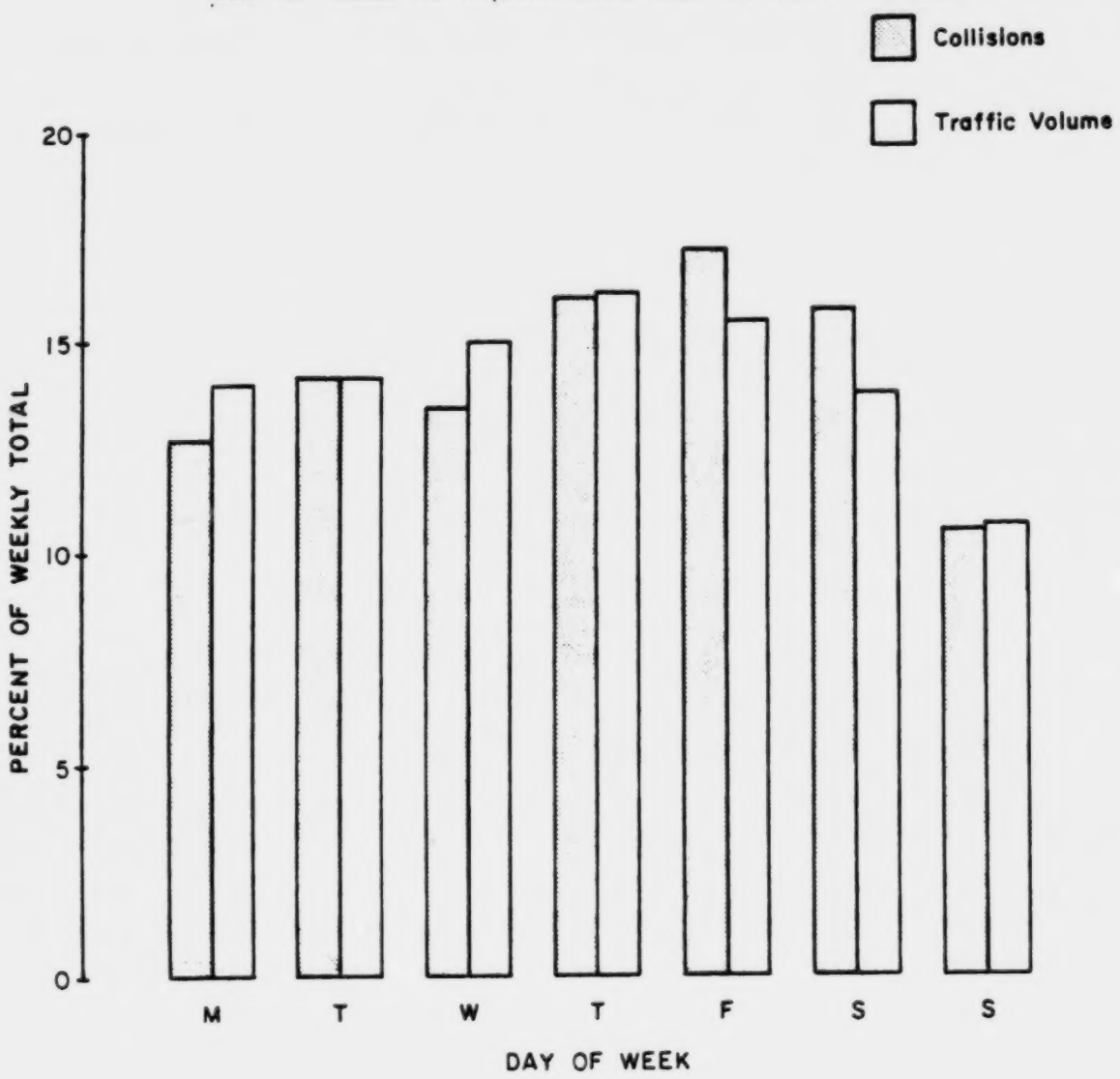
Exhibit 2-7

COLLISION OCCURRENCES BY TIME OF DAY AND DAY OF WEEK

Time	MON	TUES	WED	THUR	FRI	SAT	SUN	TOTALS	(%)
12 - 1 a.m.	11	32	29	28	43	82	78	303	(3.5)
1 - 2 a.m.	8	31	33	29	49	123	105	378	(4.4)
2 - 3 a.m.	7	9	14	13	20	52	51	166	(1.9)
3 - 4 a.m.	3	4	4	6	7	20	29	73	(0.8)
4 - 5 a.m.	2	3	8	4	4	22	19	62	(0.7)
5 - 6 a.m.	4	4	5	1	8	13	11	46	(0.5)
6 - 7 a.m.	19	24	25	21	26	18	10	143	(1.7)
7 - 8 a.m.	49	70	57	54	50	31	11	322	(3.7)
8 - 9 a.m.	65	80	76	70	77	25	3	396	(4.6)
9 - 10 a.m.	47	42	39	54	45	58	24	309	(3.6)
10 - 11 a.m.	56	51	52	70	57	52	29	367	(4.2)
11 - 12 noon	69	74	63	58	60	57	31	412	(4.8)
12 - 1 p.m.	59	56	53	68	87	76	52	451	(5.2)
1 - 2 p.m.	64	67	62	81	69	92	43	478	(5.5)
2 - 3 p.m.	90	86	78	88	72	84	37	535	(6.2)
3 - 4 p.m.	109	117	102	115	126	81	52	702	(8.1)
4 - 5 p.m.	115	143	141	143	161	56	47	806	(9.3)
5 - 6 p.m.	68	90	97	104	124	69	48	600	(6.9)
6 - 7 p.m.	62	84	44	83	69	74	46	462	(5.3)
7 - 8 p.m.	52	43	47	84	82	76	51	435	(5.0)
8 - 9 p.m.	32	34	32	64	75	57	48	342	(3.9)
9 - 10 p.m.	44	27	40	54	52	57	35	309	(3.6)
10 - 11 p.m.	40	47	39	47	56	42	31	302	(3.5)
11 - 12 a.m.	23	33	36	44	61	48	16	261	(3.0)
Totals	1,098	1,251	1,176	1,383	1,480	1,365	907	8,660	(100.0)
%	(12.7)	(14.4)	(13.6)	(16.0)	(17.1)	(15.8)	(10.5)		

THE HIGHEST ONE HOUR COLLISION PERIOD WAS FRIDAY BETWEEN 4 P.M. AND 5 P.M.

DAY OF WEEK VS COLLISIONS AND TRAFFIC VOLUME



THE HIGHEST COLLISION RATE (a) OCCURRED ON SATURDAYS

(a) RATE = $\frac{\%\ \text{COLLISIONS}}{\%\ \text{VOLUME}}$

Exhibit 2-9

MONTH OF YEAR OF OCCURRENCE OF COLLISIONS

Month	Number of Collisions	Percentage of Total Collisions
January	839	9.7
February	737	8.5
March	647	7.5
April	611	7.1
May	762	8.8
June	673	7.8
July	732	8.5
August	714	8.2
September	698	8.1
October	760	8.8
November	689	8.0
December	798	9.2
	8,660	100.0

THE HIGHEST NUMBER OF COLLISIONS OCCURRED IN THE MONTH OF JANUARY.

Exhibit 2-10

INITIAL IMPACT TYPE VS CLASSIFICATION

Initial Impact Type	Classification A Fatal Injury No.	%	B Non-Fatal Injury No.	%	C Property Damage Only No.	%	D All Collisions No.	%	Column A + B / Column D
Rear End	-	(-)	922	(27.1)	1,074	(20.5)	1,996	(23.0)	0.46
Angle	5	(17.9)	998	(29.4)	1,766	(33.7)	2,769	(32.0)	0.36
Turning	2	(7.1)	346	(10.2)	743	(14.2)	1,091	(12.6)	0.32
Sideswipe	1	(3.6)	240	(7.1)	825	(15.8)	1,066	(12.3)	0.23
Approaching	14	(50.0)	442	(13.0)	395	(7.5)	851	(9.8)	0.54
Single Motor Vehicle	6	(21.4)	415	(12.2)	388	(7.4)	809	(9.3)	0.52
Other	-	(-)	35	(1.0)	43	(0.8)	78	(0.9)	0.45
	28	(100.0)	3,398	(100.0)	5,234	(100.0)	8,660	(100.0)	

55% OF THE INITIAL IMPACTS RECORDED WERE "ANGLE" AND "REAR END".

THE PROBABILITY OF FATALITY OR OF INJURY WAS HIGHEST IN APPROACHING OR SINGLE VEHICLE COLLISIONS

Exhibit 2-11

INITIAL IMPACT TYPE VERSUS ROAD LOCATION

	Road Location								
Impact Type	Non-Intersection	Intersection Related	In Intersection	At Private Drive	At Railroad	Underpass or Tunnel	Overpass or Bridge	Other	Totals
Rear End	934	665	241	133	10	1	5	7	1,996
Angle	632	326	1,451	329	13	-	7	11	2,769
Turning	115	236	588	147	-	1	1	3	1,091
Sideswipe	647	174	164	62	-	-	9	10	1,066
Approaching	422	131	245	40	3	-	2	8	851
Single Motor Vehicle	519	137	100	36	1	2	6	8	809
Other	47	15	7	8	-	-	-	1	78
TOTALS	3,316	1,684	2,796	755	27	4	30	48	8,660
%	(38.3)	(19.5)	(32.3)	(8.7)	(0.3)	(0.1)	(0.3)	(0.5)	(100.0)

52% OF COLLISIONS WERE IN, OR ASSOCIATED WITH INTERSECTIONS

Exhibit 2-12

INITIAL IMPACT TYPE VERSUS TYPE OF TRAFFIC CONTROL

Impact Type	Type of Traffic Control: Operating Traffic Signal	Operating Stop Sign	Operating Yield Sign	Police Control	School Guard	School Bus	No Control	Other	Totals
Rear End	610	151	32	1	5	2	1,178	17	1,996
Angle	826	846	11	-	-	1	1,072	13	2,769
Turning	486	220	5	1	-	-	377	2	1,091
Sideswipe	202	103	4	1	-	-	750	6	1,066
Approaching	158	175	5	-	2	3	499	9	851
Single Motor Vehicle	94	88	12	-	-	-	607	8	809
Other	8	6	-	-	-	-	63	1	78
TOTALS	2,384	1,589	69	3	7	6	4,546	56	8,660
%	(27.5)	(18.3)	(0.8)	(0.1)	(0.1)	(0.1)	(52.5)	(0.6)	(100.0)

GREATER THAN ONE-HALF OF ALL COLLISIONS (52%) OCCURRED AT LOCATIONS WITH NO TRAFFIC CONTROL.

Chapter Three
Drivers

Driver Age

Although sixteen to nineteen year olds make up only 7 percent of the licenced driving population, this age group was involved in 13.4 percent of reported collisions (Exhibit 3-1).

Furthermore, the involvement rate for the younger age groups may prove to be even higher if measured in terms of vehicle-miles driven. Younger drivers may be less likely to own their vehicle, less likely to require or use a vehicle for work trips and less likely to drive extended distances.

Drivers under 20 involved in collisions were less likely to have been driving properly at the time of the collision (Exhibit 3-2). Younger drivers involved in collisions were more likely to have committed improper driving actions resulting from poor judgement or lack of maturity. Frequent improper driver actions for this age group were "speed too fast", "loss of control of the vehicle", "failure to yield the right-of-way" and "following too close". Drivers over 65 years of age involved in collisions were more likely to have committed infractions involving non-compliance with traffic regulations such as "failure to yield the right-of-way" or "improper turn".

Drinking Drivers

Drinking drivers were involved in 12.2 percent of all reported collisions, 28.6 percent of the fatal and 15.4 percent of the injury collisions (Exhibit 3-3). There was a 27 percent greater chance of an injury occurring in a collision which involved a driver who had been drinking. Drivers reported as impaired had relatively constant probability of involvement in injury-causing or property damage only collisions.

Exhibit 3-4 indicates that 39 percent of the collisions which occurred during the period from 10 p.m. to 3 a.m. from Wednesdays to Sundays involved drinking drivers.

Exhibit 3-5 indicates that less than 12 percent of the drivers involved in collisions who had been drinking or were impaired were driving properly at the time of the collision and the most frequently indicated improper driver action was loss of control of the vehicle.

Driver age groups from 16 to 54 had similar percentages of drivers who were impaired or who had been drinking (Exhibit 3-6).

Hit and Run Collisions

In 1981 there were 1,092 hit and run collisions involving 1,095 hit and run drivers of which 39 percent were subsequently apprehended (Exhibit 3-7). Although the hit and run collision is more likely to be of a "property damage only" classification as

opposed to other collisions (Exhibit 3-8), the hit and run driver is attempting to escape responsibility for his actions and this is of particular concern when a personal injury or fatality is involved. The hit and run driver may also be involved with other driving infractions at the time of the collision such as impaired driving or failure to have an operator's permit.

Non-Licenced Drivers

It was determined that the non-licenced driver, including those whose licence was under suspension, was more likely to be involved in a fatal or injury collision (Exhibit 3-9) and also more likely to be under the influence of alcohol at the time of the collision (Exhibit 3-10). The non-licenced driver was also more likely to have been driving too fast for roadway conditions at the time of the collision (Exhibit 3-11).

Exhibit 3-12 indicates that 56 percent of the collisions involving a non-licenced driver occurred between 6 p.m. and 6 a.m. whereas only 36 percent of all collisions occurred during this period. The exhibit also indicates that 81 percent of the alcohol-related collisions occurred during this period. The 6 p.m. to 6 a.m. period is characterized by high alcohol involvement, high involvement of non-licenced drivers and high collision involvement rate.

Moving Violations

The Regional Police Department issued over 50,000 moving violation summonses in 1981 and this effort at reducing traffic collisions by selective enforcement is recognized. However, it was determined that, in many cases, enforcement was directed at violations that do not relate proportionately to violations indicated in traffic collisions. This could indicate that the enforcement effort is very successful in that it eliminates collisions of related types. However, this may be an indication that a portion of the enforcement effort is directed at moving violations that are readily enforceable (Exhibit 3-13). It is recognized that some violations involved in collisions are difficult to enforce or represent an unfeasible countermeasure to collision occurrences. For example, "following too close" was indicated in 19.6 percent of the improper driving actions and "failure to yield the right-of-way" was indicated in 26.5 percent of improper driving actions. The former is difficult to enforce in the absence of a collision, and it is unfeasible to enforce the latter. Selective enforcement nonetheless is a recognized collision countermeasure technique for other types of moving violations.

Motorcycles

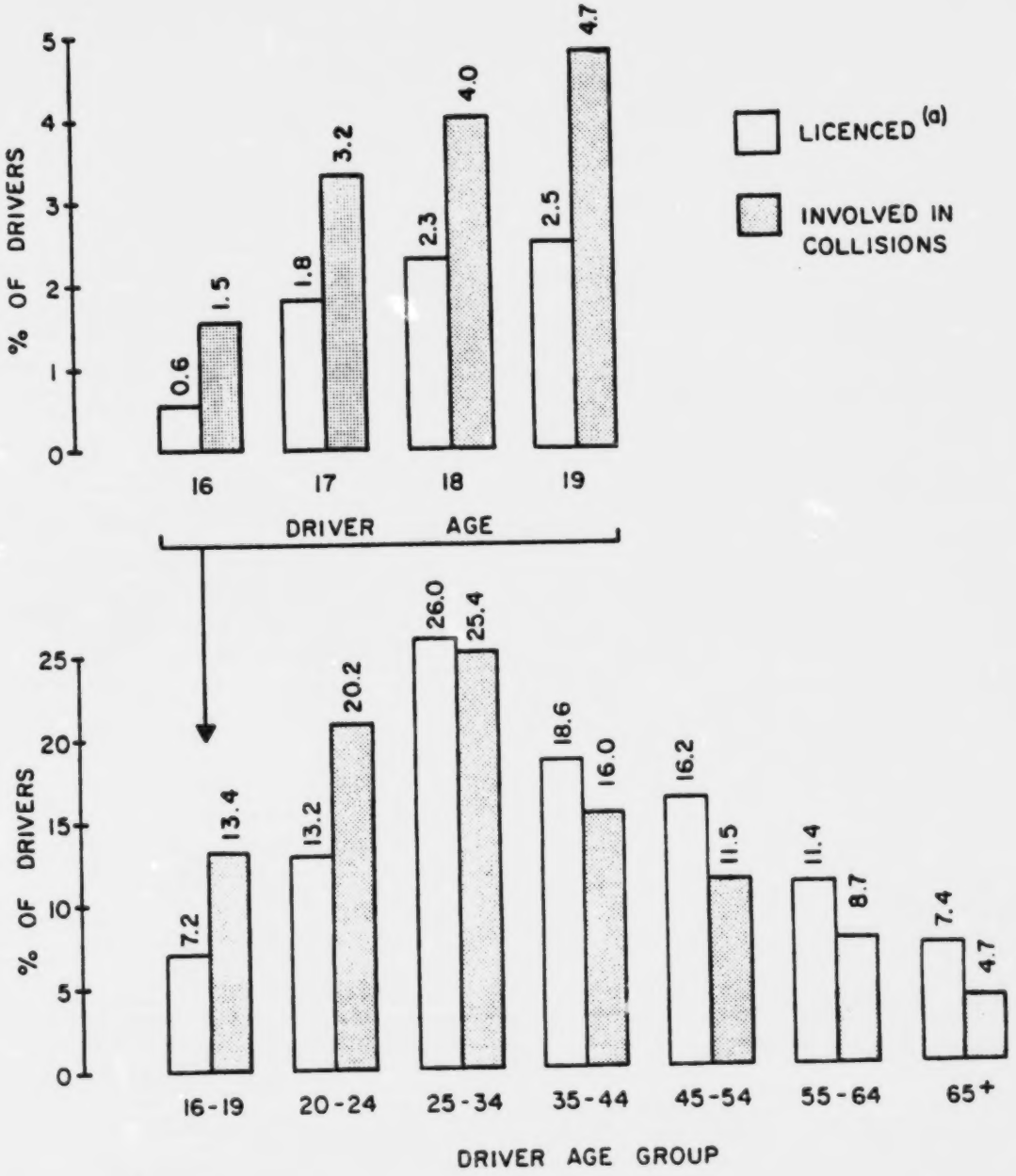
The proportion of motorcycle drivers involved in collisions driving properly in most age groups is higher than the proportion for all other motor vehicle drivers for the same age groups (Exhibit 3-14). This exhibit also indicates that the most frequent improper driver action for motorcyclists was "lost control".

Without more refined data on exposure of motorcyclists in traffic under non-collision circumstances, the significance of a higher proportion of involved motorcycle drivers driving properly in a collision cannot be specifically determined. It could be hypothesized that a motorcycle operator is particularly prone to being involved in a collision when driving properly or alternatively, that the motorcycle operator is particularly adept in avoiding a collision for which he or she would have been responsible.

Bicycles

It was determined that responsibility for a collision involving a bicyclist decreased with increased bicyclist age and that 35 percent or less of bicyclists under 15 involved in collisions were recorded as driving properly (Exhibit 3-15). The most predominant known cyclist improper action indicated was "failure to yield the right-of-way" but instances of disobeying other traffic laws were also prominent.

LICENCED MOTOR VEHICLE DRIVER AGE VS COLLISION INVOLVEMENT



16 TO 19 YEAR OLD DRIVERS WERE INVOLVED IN MORE COLLISIONS PER LICENCED DRIVER THAN ANY OTHER AGE GROUP.

(a) Licenced in the Province of Ontario.

Exhibit 3-2

MOTOR VEHICLE DRIVER AGE VS DRIVER ACTION

Driver Action	0-4	5-9	10-14	15-19	20-24	25-34
Driving Properly	-	1	1	749	1,365	1,983
Following Too Close	-	-	-	192	296	244
Speed Too Fast	-	-	1	77	70	65
Improper Turn	-	-	1	103	127	168
Disobey Traffic Signal	-	-	1	49	81	86
Disobey Stop Sign	-	-	-	48	57	57
Fail to Yield R.O.W.	1	2	1	187	252	334
Improper Passing	-	-	-	18	20	29
Lost Control	2	-	2	238	232	205
Wrong Way One-Way Street	-	-	-	2	6	9
Not Known	1	-	1	120	168	213
Other	-	-	1	172	253	283
Disobey Other Control	1	-	-	9	11	17
Totals	5	3	9	1,964	2,938	3,693
% Drivers involved driving properly(b)	-	33.3	14.3	44.8	54.2	62.0

(a) Note - 3 ages not stated.
(b) Excluding "Not Known" and "Other".
(c) Twenty-eight non-licenced drivers between the ages of 13 and 15 included.
Eleven non-licenced drivers between the ages of 15 and 16 included.

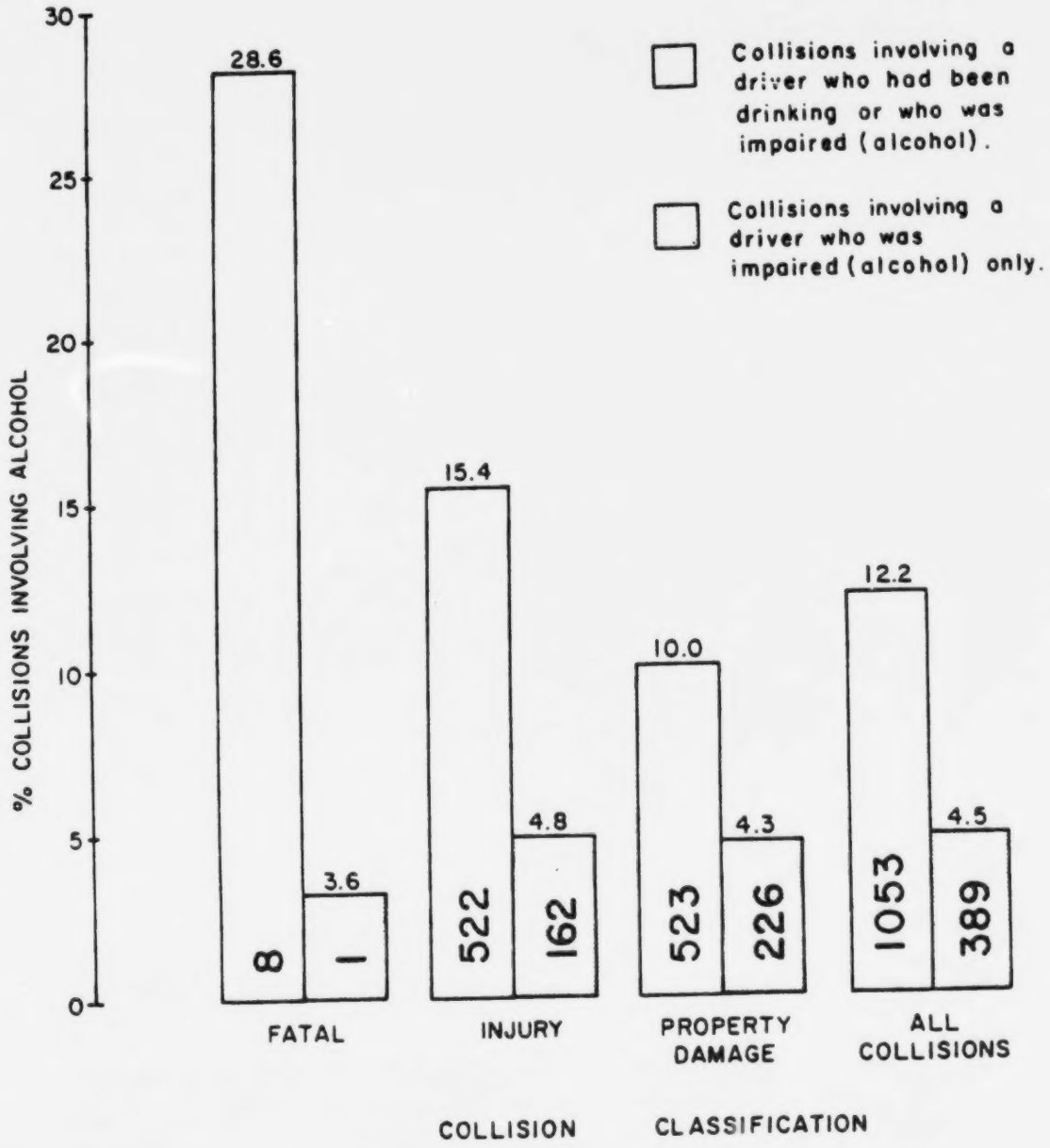
35-44	45-54	55-64	65-74	75 +	Totals	(%)	Driver Action
1,282	899	580	199	43	7,102	(48.8)	Driving Properly
172	104	75	27	8	1,118	(7.7)	Following Too Close
24	16	8	1	-	262	(1.8)	Speed Too Fast
104	86	101	50	23	763	(5.2)	Improper Turn
78	50	63	21	8	437	(3.0)	Disobey Traffic Signal
31	26	18	24	1	262	(1.8)	Disobey Stop Sign
211	198	181	109	32	1,508	(10.4)	Fail to Yield R.O.W.
10	7	5	1	-	90	(0.6)	Improper Passing
114	59	47	18	8	925	(6.3)	Lost Control
3	3	-	1	1	25	(0.2)	Wrong Way One-Way Street
121	91	83	30	5	833	(5.7)	Not Known
160	133	98	47	19	1,166	(8.0)	Other
13	7	6	3	-	67	(0.5)	Disobey Other Control
2,323	1,679	1,265	531	148	14,558(a)	(100.0)	Totals
62.8	61.8	53.5	43.8	34.7	56.5		% Drivers involved driving properly (b)

THE OVERALL PERCENTAGE OF DRIVERS DRIVING PROPERLY WAS 56.5%. THE PERCENTAGE OF DRIVERS DRIVING PROPERLY FOR DRIVER AGE GROUPS UNDER 20 AND OVER 74 WAS LESS THAN 50%.

THE MOST FREQUENT RECORDED IMPROPER DRIVING ACTION WAS FAILING TO YIELD RIGHT-OF-WAY.

Exhibit 3-3

ALCOHOL INVOLVEMENT VS COLLISION CLASSIFICATION



COLLISIONS IN WHICH AN INJURY OR FATALITY OCCURRED WERE MORE LIKELY TO INVOLVE A DRIVER WHO HAD BEEN DRINKING THAN PROPERTY DAMAGE ONLY COLLISIONS.

IMPAIRED DRIVERS HAD RELATIVELY EQUAL INVOLVEMENT IN ALL CLASSIFICATIONS OF COLLISIONS.

Exhibit 3-4

TIME OF DAY AND DAY OF WEEK OF COLLISIONS INVOLVING ALCOHOL

Time of Day	MON	TUES	WED	THUR	FRI	SAT	SUN	TOTAL
12 - 1 a.m.	4	12	14	12	18	32	32	124
1 - 2 a.m.	4	14	16	15	21	56	47	173
2 - 3 a.m.	1	5	6	5	7	23	18	65
3 - 4 a.m.	1	1	1	5	2	14	11	35
4 - 5 a.m.	-	-	2	2	1	7	7	19
5 - 6 a.m.	1	-	-	-	2	3	3	9
6 - 7 a.m.	1	1	2	-	-	2	1	7
7 - 8 a.m.	-	-	-	-	3	2	1	6
8 - 9 a.m.	-	-	-	1	-	2	-	3
9 - 10 a.m.	-	-	-	-	-	1	1	2
10 - 11 a.m.	-	1	1	-	1	2	1	6
11 - 12 noon	-	3	-	3	-	-	1	7
12 - 1 p.m.	-	-	1	2	4	4	3	14
1 - 2 p.m.	1	1	1	1	3	5	1	13
2 - 3 p.m.	1	1	2	1	3	3	3	14
3 - 4 p.m.	3	2	4	4	7	4	2	26
4 - 5 p.m.	6	3	6	7	7	7	4	40
5 - 6 p.m.	7	6	8	9	6	13	8	57
6 - 7 p.m.	6	9	4	10	8	12	8	57
7 - 8 p.m.	7	4	2	6	15	24	10	68
8 - 9 p.m.	3	6	2	7	17	12	8	55
9 - 10 p.m.	13	7	13	17	10	18	7	85
10 - 11 p.m.	9	9	8	14	22	14	12	88
11 - 12 midnight	4	5	13	14	21	18	5	80
Totals	72	90	106	135	178	278	194	1,053

39% OF THE COLLISIONS WHICH OCCURRED DURING THE PERIOD FROM 10:00 P.M. TO 3:00 A.M., WEDNESDAYS TO SUNDAYS INVOLVED ALCOHOL.

10% OF ALL ALCOHOL RELATED COLLISIONS OCCURRED BETWEEN 1:00 A.M. AND 2:00 A.M. ON SATURDAYS AND SUNDAYS.

Exhibit 3-5

DRIVER ACTION VS DRIVER CONDITION

	Normal	Had Been Drinking	Impaired-Alcohol	Impaired-Drugs	Fatigue
Driving Properly	6,937	106	4	1	-
Following Too Close	1,023	50	18	2	1
Speed Too Fast	146	66	29	-	-
Improper Turn	712	28	8	-	1
Disobey Traffic Signal	390	18	15	1	-
Disobey Stop Sign	238	12	4	-	-
Fail to Yield Right-of-Way	1,413	51	12	-	-
Improper Passing	75	8	2	-	-
Lost Control	580	169	107	2	2
Wrong Way on One-Way Street	16	3	5	-	-
Not Known	477	52	40	3	1
Other	856	117	137	4	6
Disobey Other Control	55	3	5	-	-
Totals	12,918	683	386	13	11
% Drivers involved driving properly(a)	59.9	20.6	1.9	16.7	-

(a) Excluding not known and other.

Medical Defect	Not Known	Other	Totals	(%)	
2	53	-	7,103	(48.8)	Driving Properly
-	24	-	1,118	(7.7)	Following Too Close
-	21	-	262	(1.8)	Speed Too Fast
-	10	4	763	(5.2)	Improper Turn
2	11	-	437	(3.0)	Disobey Traffic Signal
1	7	-	262	(1.8)	Disobey Stop Sign
1	31	-	1,508	(10.4)	Fail to Yield Right-of-Way
-	5	-	90	(0.6)	Improper Passing
3	60	2	925	(6.3)	Lost Control
-	-	1	25	(0.2)	Wrong Way on One-Way Street
-	257	3	833	(5.7)	Not Known
3	45	-	1,168	(8.0)	Other
-	3	1	67	(0.5)	Disobey Other Control
12	527	11	14,561	(100.0)	Totals
22.2	-	-	56.6		% Drivers involved driving properly

LESS THAN 12% OF DRIVERS WHO HAD BEEN DRINKING OR WERE IMPAIRED WERE RECORDED AS DRIVING PROPERLY AT THE TIME OF THE COLLISION.

Exhibit 3-6

MOTOR VEHICLE DRIVER AGE VS DRIVER CONDITION

Driver Condition	0 - 4	5 - 9	10 - 14	15 - 19	20 - 24	25 - 34
Normal	3	3	8	1,725	2,544	3,255
Had Been Drinking	-	-	-	101	180	191
Impaired - Alcohol	-	-	-	33	83	112
Impaired - Drugs	-	-	-	-	3	6
Fatigue	-	-	-	3	3	1
Medical Defect	-	-	-	-	2	2
Not Known	1	-	1	100	122	125
Other	1	-	-	2	1	1
Totals	5	3	9	1,964	2,938	3,693
% Drinking Drivers Involved (Excluding Not Known and Other)	-	-	-	7.2	9.3	8.5

(a) Three driver ages not stated.

35 - 44	45 - 54	55 - 64	65 - 74	75 +	Total	(%)	Driver Condition
2,068	1,528	1,154	491	137	12,916	(88.7)	Normal
109	52	33	14	2	682	(4.7)	Had Been Drinking
65	53	33	7	-	386	(2.7)	Impaired - Alcohol
2	1	1	-	-	13	(0.1)	Impaired - Drugs
3	1	-	-	-	11	(0.1)	Fatigue
-	4	1	2	1	12	(0.1)	Medical Defect
75	40	43	16	4	527	(3.5)	Not Known
1	-	-	1	4	11	(0.1)	Other
2,323	1,679	1,265	531	148	14,558(a)	(100.0)	Totals
7.7	6.4	5.4	4.1	1.4	7.6		% Drinking Drivers Involved (Excluding Not Known and Other)

7.6% OF ALL DRIVERS INVOLVED HAD BEEN DRINKING OR WERE IMPAIRED BY ALCOHOL AT THE TIME OF THE COLLISION.

15 TO 55 YEAR OLD DRIVERS HAD APPROXIMATELY THE SAME LIKELIHOOD OF BEING UNDER THE INFLUENCE OF ALCOHOL AT THE TIME OF A COLLISION.

Exhibit 3-7

HIT AND RUN COLLISIONS

HIT AND RUN COLLISIONS	1,092	
HIT AND RUN DRIVERS (a)	1,095	
DRIVERS APPREHENDED	426	39%

39% OF HIT AND RUN DRIVERS WERE SUBSEQUENTLY APPREHENDED.

Exhibit 3-8

HIT AND RUN COLLISION CLASSIFICATION

COLLISIONS IN WHICH:	FATAL	INJURY	PROPERTY DAMAGE	TOTAL
Driver(s) Apprehended	1	146	277	424
Driver(s) Not Apprehended	-	122	546	668
TOTAL	1 (0.1%)	268 (24.5%)	823 (75.4%)	1,092 (100.0%)

75.4% OF HIT AND RUN COLLISIONS INVOLVED PROPERTY DAMAGE ONLY.

(a) Some collisions involved more than one hit and run driver.

Exhibit 3-9

LICENCE STATUS OF MOTOR VEHICLE DRIVERS VS CLASSIFICATION OF COLLISION

Classification	Non-Licenced (a) No.	(% of Non-Licenced)	Licenced No.	(% of Licenced)
Fatal	1	(0.4)	37	(0.3)
Injury	97	(41.8)	5,642	(39.6)
Property Damage	134	(57.8)	8,578	(60.1)
Total	232	(100.0)	14,257	(100.0)

A HIGHER PROBABILITY OF A FATAL OR INJURY COLLISION IS ASSOCIATED WITH THE INVOLVEMENT OF A NON-LICENCED DRIVER.

Exhibit 3-10

LICENCE STATUS OF MOTOR VEHICLE DRIVERS VS DRIVER CONDITION

Driver Condition	Non-Licenced (a) No.	(% of Non-Licenced)	Licenced No.	(% of Licenced)
Normal	116	(50.0)	12,802	(89.3)
Had Been Drinking	40	(17.2)	643	(4.5)
Impaired - Alcohol	34	(14.7)	352	(2.4)
Impaired - Drugs	1	(0.4)	2	(0.1)
Fatigue	1	(0.4)	10	(0.1)
Medical Defect	-	(-)	12	(0.1)
Not Known	38	(16.4)	489	(3.4)
Other	2	(0.9)	9	(0.1)
Total	232	(100.0)	14,329	(100.0)

A HIGHER PROBABILITY OF ALCOHOL USE WAS ASSOCIATED WITH THE INVOLVEMENT OF A NON-LICENCED DRIVER.

AN UNLICENCED DRIVER INVOLVED IN A COLLISION WAS OVER FIVE TIMES AS LIKELY TO HAVE BEEN UNDER THE INFLUENCE OF ALCOHOL OR DRUGS AS A LICENCED DRIVER.

(a) Information on 9 drivers not included.

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Exhibit 3-11

LICENCE STATUS OF MOTOR VEHICLE DRIVER VS DRIVER ACTION

Driver Action	Non-Licenced (b) No.	(% of Non-Licenced)	Licenced No.	(% of Licenced)
Driving Properly	40	(17.2)	7,063	(49.3)
Following Too Close	15	(6.5)	1,103	(7.7)
Speed Too Fast	11	(4.7)	251	(1.8)
Improper Turn	8	(3.5)	755	(5.3)
Disobey Traffic Signal	9	(3.9)	428	(2.9)
Disobey Stop Sign	4	(1.7)	258	(1.8)
Fail to Yield R.O.W.	23	(9.9)	1,485	(10.4)
Improper Passing	1	(0.4)	89	(0.6)
Lost Control	49	(21.1)	876	(6.1)
Wrong Way on One Way Street	2	(0.9)	23	(0.2)
Not Known	33	(14.2)	800	(5.6)
Other	34	(14.7)	1,134	(7.9)
Disobey Other Control	3	(1.3)	64	(0.4)
Total	232	(100.0)	14,329	(100.0)
% Drivers Driving Properly (a)		(24.2)		(57.0)

24% OF INVOLVED NON-LICENCED DRIVERS WERE DRIVING PROPERLY COMPARED WITH 57% OF LICENCED DRIVERS.

THE MOST FREQUENT RECORDED IMPROPER DRIVING ACTIONS FOR NON-LICENCED DRIVERS WERE "LOST CONTROL" AND "FAIL TO YIELD RIGHT OF WAY".

(a) Excluding "Not Known" and "Other".

(b) Information on 9 drivers not included.

Exhibit 3-12

TIME OF DAY VERSUS COLLISIONS FOR TOTAL COLLISIONS, COLLISIONS INVOLVING NON-LICENCED DRIVERS AND COLLISIONS INVOLVING ALCOHOL.

Time of Day	Collisions Involving Non-Licenced Drivers No.	(%)	% of Collisions Involving Alcohol	% of Total Collisions Occurring
12 - 1 a.m.	17	7.1	11.8	3.5
1 - 2 a.m.	13	5.4	16.4	4.4
2 - 3 a.m.	14	5.8	6.2	1.9
3 - 4 a.m.	8	3.3	3.3	0.8
4 - 5 a.m.	3	1.2	1.8	0.7
5 - 6 a.m.	5	2.1	0.8	0.5
6 - 7 a.m.	4	1.7	0.7	1.7
7 - 8 a.m.	2	0.8	0.6	3.7
8 - 9 a.m.	7	2.9	0.3	4.6
9 - 10 a.m.	6	2.5	0.2	3.6
10 - 11 a.m.	6	2.5	0.6	4.2
11 - 12 noon	5	2.1	0.7	4.8
12 - 1 p.m.	5	2.1	1.3	5.2
1 - 2 p.m.	13	5.4	1.2	5.5
2 - 3 p.m.	14	5.8	1.3	6.2
3 - 4 p.m.	16	6.6	2.5	8.1
4 - 5 p.m.	14	5.8	3.8	9.3
5 - 6 p.m.	14	5.8	5.4	6.9
6 - 7 p.m.	13	5.4	5.4	5.3
7 - 8 p.m.	8	3.3	6.4	5.0
8 - 9 p.m.	13	5.4	5.2	3.9
9 - 10 p.m.	14	5.8	8.1	3.6
10 - 11 p.m.	15	6.2	8.4	3.5
11 - 12 midnight	12	5.0	7.6	3.0
Totals	241	100.0	100.0	100.0

BETWEEN 6 P.M. AND 6 A.M., THERE WAS A HIGHER PROPORTION OF NON-LICENCED DRIVERS INVOLVED IN COLLISIONS.
ALCOHOL INVOLVEMENT IN COLLISIONS FOLLOWED A SIMILAR PATTERN.

Exhibit 3-13

IMPROPER DRIVER ACTIONS VS ENFORCEMENT

Column A	Column B		
Apparent Improper Driver Action	% of Improper Driver Actions In Collisions	% of All Comparable Charges Laid in 1981 by Hamilton-Wentworth Police	Column B / Column A
Follow too close	19.6	2.4	0.1
Speed too fast	4.6	41.8	9.1
Improper turn	13.4	14.0	1.0
Disobey traffic signal	7.7	16.1	2.1
Disobey stop sign	4.6	6.3	1.4
Fail to yield right-of-way	26.5	2.6	0.1
Improper passing	1.6	0.2	0.2
Wrong way on one-way street	0.4	2.2	5.5
Disobey other control	1.2	4.4	3.7
Other	20.4	10.0	0.5
	100.0	100.0	

46% OF IMPROPER DRIVER ACTIONS ASSOCIATED WITH COLLISIONS ARE DRIVER ACTIONS WHICH CANNOT BE READILY ENFORCED, SUCH AS FOLLOWING TOO CLOSELY, OR FAILING TO YIELD THE RIGHT OF WAY.

A PREDOMINANT NUMBER OF CHARGES WERE LAID UNDER LAWS WHICH ARE READILY ENFORCED.

Exhibit 3-14

MOTORCYCLE DRIVER AGE VS DRIVER ACTION

Driver Action	0 - 14	15 - 19	20 - 24	25 - 34	35 - 44	45 +	Total	(%)
Driving Properly	1	20	52	49	7	1	130	(61.0)
Following Too Close	-	3	7	2	-	-	12	(5.6)
Speed Too Fast	-	3	5	2	-	-	10	(4.7)
Improper Turn	-	-	1	-	-	1	2	(0.9)
Disobey Traffic Signal	-	1	3	-	-	-	4	(1.9)
Disobey Stop Sign	-	-	-	1	-	-	1	(0.5)
Fail to Yield R.O.W.	-	4	3	-	-	-	7	(3.3)
Improper Passing	-	2	1	1	-	-	4	(1.9)
Lost Control	-	4	11	4	-	-	9	(9.0)
Wrong Way One-Way Street	-	-	-	-	-	-	-	(-)
Not Known	-	2	7	3	-	-	12	(5.6)
Other	-	2	6	2	-	-	10	(4.7)
Disobey Other Control	-	-	-	2	-	-	2	(0.9)
Totals	1	41	96	66	7	2	213	(100.00)
% Involved Motorcycle Drivers Driving Properly(a)	100.0	54.1	62.7	80.3	100.0	50.1	68.1	
% Involved Vehicle Drivers Driving Properly(a)	11.8	44.8	54.2	62.0	62.8	47.5	56.5	

THE MOTORCYCLE DRIVER WAS MORE LIKELY TO BE DRIVING PROPERLY THAN A MOTOR VEHICLE OPERATOR IN THE SAME AGE GROUP.

THE MOST FREQUENT IMPROPER MOTORCYCLE DRIVER ACTION WAS "LOST CONTROL".

(a) Excluding "not known" and "other".

Exhibit 3-15

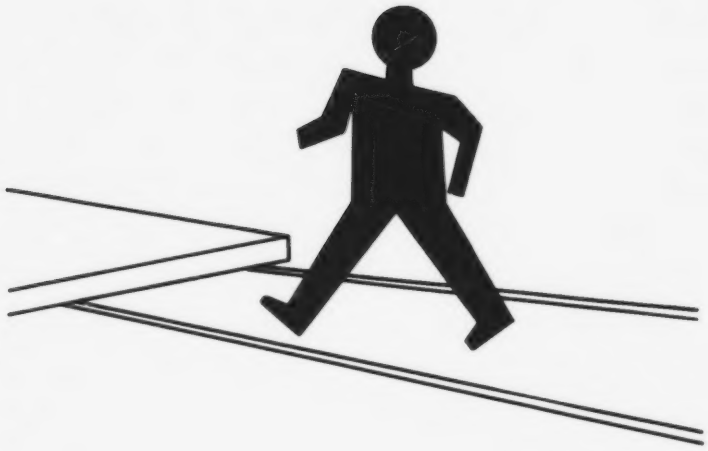
CYCLIST ACTION VS AGE OF CYCLIST

Apparent Cyclist Action	0 - 4	5 - 9	10 - 14	15 - 19	20 - 24
Driving Properly	1	8	12	29	7
Following Too Close	-	-	-	-	-
Speed Too Fast	-	3	1	1	-
Improper Turn	-	-	2	2	1
Disobey Traffic Signal	-	1	-	3	3
Disobey Stop Sign	-	5	6	1	-
Fail to Yield Right-of-Way	1	10	6	1	-
Improper Passing	-	-	-	1	-
Lost Control	-	3	4	2	-
Wrong Way on One-Way Road	-	-	2	1	-
Not Known	-	4	2	3	4
Other	-	2	7	4	-
Disobey Other Control	-	-	2	-	-
Totals	2	36	44	48	15
% Involved Cyclists Driving Properly (a)	50.0	26.7	34.3	70.7	63.6

(a) Excluding "Not Known" and "Other".

25 - 34	35 - 44	45 - 54	55 +	Totals	(%)	Apparent Cyclist Action
4	2	1	2	66	(40.0)	Driving Properly
1	-	-	-	1	(0.6)	Following Too Close
-	-	-	-	5	(3.0)	Speed Too Fast
-	-	-	1	6	(3.6)	Improper Turn
-	-	-	-	7	(4.2)	Disobey Traffic Signal
-	1	-	-	13	(8.0)	Disobey Stop Sign
-	-	-	-	18	(10.9)	Fail to Yield Right-of-Way
-	-	-	-	1	(0.6)	Improper Passing
-	1	1	-	11	(6.7)	Lost Control
-	1	-	1	5	(3.0)	Wrong Way on One-Way Road
-	2	2	-	17	(10.3)	Not Known
-	-	-	-	13	(7.9)	Other
-	-	-	-	2	(1.2)	Disobey Other Control
5	7	4	4	165	(100.0)	Totals
80.0	40.0	50.0	50.0	48.9		% Involved Cyclists Driving Properly

CYCLISTS UNDER 15 WERE MOST LIKELY TO BE DRIVING IN A MANNER THAT VIOLATED BASIC RULES OF THE ROAD.



Chapter Four
Pedestrians

General

In 1981, there were 451 pedestrian collisions resulting in 458 pedestrian injuries, and 10 fatalities.

Age

The relationship between the Regional population distribution and pedestrian involvement in collisions in 1981 was reviewed (Exhibit 4-1). It was determined that 5 to 9 year old pedestrians had a disproportionate rate of collision involvement when compared on the basis of the age distribution of the Regional population.

The variations in rate might be explained by certain pedestrian age groups crossing streets more frequently than others (i.e. exposure). It is, however, unlikely that the 5 to 9 year old group would have different exposure to traffic than the 10 to 14 year old group, and, therefore, the 5 to 9 year old pedestrian would appear to be considerably more prone to collision involvement.

Pedestrian Action

Exhibit 4-2 indicates the pedestrian action at the time of the collision versus pedestrian age. In general, the instances of unsafe pedestrian action for pedestrians involved in collisions were greater for pedestrians under 20 years of age.

This exhibit also indicates that the actions of "coming from behind a parked car" or "unexpectedly running into the roadway" accounted for 26 percent of the pedestrian actions at the time of the collisions. These unsafe actions are particularly associated with pedestrians under 9 years of age.

Pedestrians under 20 years of age were more likely to be involved in collisions as a result of not crossing with the right of way at traffic signals (Exhibit 4-3).

Time of Collision

An analysis was performed on the time of day of collisions compared to pedestrian age (Exhibit 4-4) and it was determined that 27 percent of pedestrians were injured in collisions which occurred between 3 p.m. and 6 p.m. Sixty-three pedestrian collisions involved children between 5 and 14 years of age at school crossing times.* This

* School crossing times: 8:00 a.m. - 9:15 a.m., 11:30 a.m. - 1:45 p.m., 3:30 p.m. - 4:45 p.m., Monday - Friday; excluding July 1 - September 4, Inclusive.

represented 18 percent of the 444 pedestrian collisions in 1980 or 55 percent of all collisions involving 5 - 14 year olds. Of the 63 collisions involving school-age children during school-crossing hours, 18 occurred at traffic signals.

Pedestrian Condition

In most cases, the condition of the pedestrian involved in the collision was reported as normal. However, in approximately 6 percent of the collisions involving pedestrians, the pedestrian condition was recorded as "had been drinking" or "impaired" (Exhibit 4-5).

Locations

Exhibit 4-6 indicates the pedestrian age for pedestrians involved in collisions compared with the type of traffic control. In 47 percent of the pedestrian collisions, the collision occurred at a mid-block or other location with no control. For pedestrians under 10 years of age, 68 percent were involved at mid-block or other locations with no control. This is to be expected, as the majority of collisions that involved a young pedestrian resulted from the pedestrian entering the roadway unexpectedly.

Driver Action

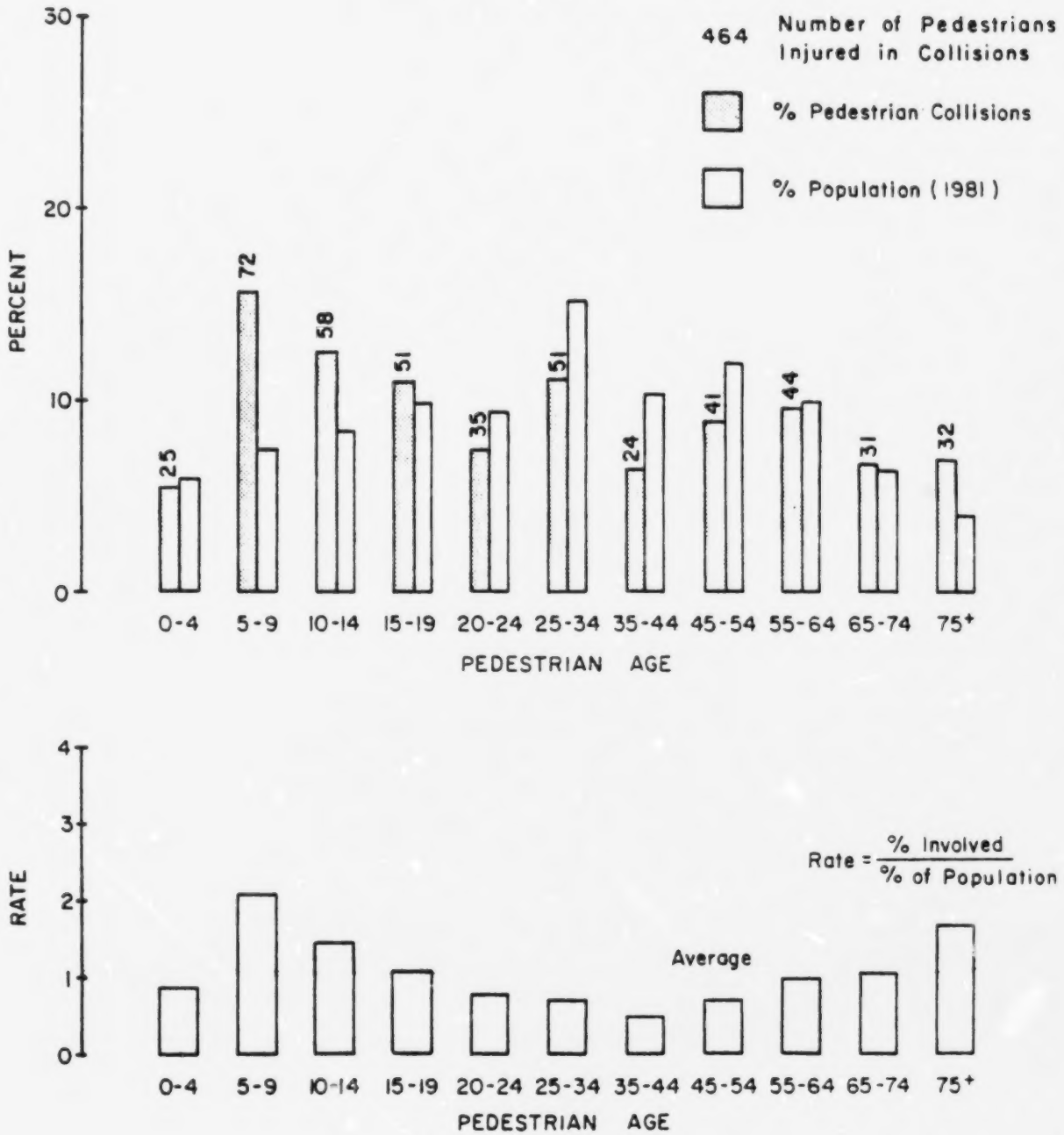
Exhibit 4-7 indicates that in approximately 58 percent of the motor vehicle-pedestrian collisions, the driver was recorded as driving properly. This figure does not necessarily suggest that the drivers involved in these collisions were totally without blame but does indicate that a majority of pedestrian collisions are associated with improper pedestrian action or lack of awareness of traffic conditions at the time of the collision.

Of the 42 percent of motor vehicle-pedestrian collisions in which the driver was not driving properly, the most frequently recorded driver action was failing to yield the right-of-way (associated with 13 percent of all motor vehicle-pedestrian collisions).

Pedestrian Injuries

Most pedestrians (approximately 80%) suffered only minor injuries when involved in a collision. Exhibit 4-8 indicates that pedestrians under 5 or over 44 years of age were more likely to suffer serious injury. This figure may be as a result of crossing behaviour or may simply reflect the average persons' ability to recover from injury or partially avoid the collision.

PEDESTRIAN AGE VS POPULATION



5 TO 9 YEAR OLD PEDESTRIANS HAD A COLLISION INVOLVEMENT ALMOST TWICE THE AVERAGE.

Exhibit 4-2

PEDESTRIAN AGE VS ACTION

Pedestrian Action	0 - 4	5 - 9	10 - 14	15 - 19	20 - 24	25 - 34
Crossing intersection with right-of-way	-	11	10	6	10	12
Crossing intersection without right-of-way	-	6	10	10	3	5
Crossing intersection - no control	2	1	1	3	2	1
Walk with traffic	-	-	-	1	-	1
Walk against traffic	-	-	-	1	-	3
On sidewalk or shoulder	1	1	2	2	3	4
Play/work on highway	1	1	1	2	1	1
Come from behind parked car	6	14	8	1	-	3
Run into roadway	14	31	10	6	3	7
Cross through traffic	-	5	11	9	9	2
Other	1	2	5	10	4	12
Totals	25	72	58	51	35	51
% Involved Pedestrians with Unsafe Action (Excluding "other")	87.5	81.4	75.5	70.7	51.6	48.7

NOTE: Four pedestrian ages not stated.

35 - 44	45 - 54	55 - 64	65 - 74	75 +	Total	(%)	Pedestrian Action
6	11	22	16	10	114	(24.6)	Crossing intersection with right-of-way
1	10	4	2	5	56	(12.1)	Crossing intersection without right-of-way
-	2	1	1	1	15	(3.2)	Crossing intersection - no control
1	-	-	-	-	3	(0.6)	Walk with traffic
-	1	-	-	-	5	(1.1)	Walk against traffic
1	6	6	-	2	28	(6.0)	On sidewalk or shoulder
-	1	-	-	-	8	(1.7)	Play/work on highway
1	1	1	1	-	36	(7.8)	Come from behind parked car
3	3	4	1	1	83	(17.9)	Run into roadway
3	3	3	5	9	59	(12.7)	Cross through traffic
8	3	3	5	4	57	(12.3)	Other
24	41	44	31	32	464	(100.0)	Totals
56.3	47.4	29.3	34.6	53.6	60.2		% Involved Pedestrians with Unsafe Action (Excluding "other")

IN GENERAL, THE INSTANCES OF UNSAFE PEDESTRIAN ACTIONS WERE HIGHER FOR AGE GROUPS UNDER 20 AND OVER 75.

26% OF PEDESTRIANS INVOLVED IN COLLISIONS ENTERED THE ROADWAY UNEXPECTEDLY (CAME FROM BEHIND PARKED CARS OR RAN INTO THE ROADWAY).

Exhibit 4-3

PEDESTRIAN AGE VS ACTION AT TRAFFIC SIGNALS

Pedestrian Action	0 - 4 Years	5 - 9 Years	10 - 14 Years	15 - 19 Years	20 - 24 Years	25 - 34 Years
Crossing Intersection with Right-of-Way	-	6	6	4	8	8
Crossing Intersection without Right-of-Way	-	5	9	7	2	3
On Sidewalk or Shoulder	-	-	-	-	-	1
Come From Behind Parked Car	1	1	-	-	-	1
Run Into Roadway	1	3	-	2	1	1
Cross Through Traffic	-	1	2	1	-	-
Other	1	-	1	-	1	3
Total	3	16	18	14	12	17
% Pedestrians Crossing or Walking with Right-of-Way (a)	-	37.5	35.3	28.6	72.7	64.3

35 - 44 Years	45 - 54 Years	55 - 64 Years	65 - 74 Years	75 + Years	Row Total	%	Pedestrian Action
4	8	16	13	9	82	50.3	Crossing Intersection with Right-of-Way
1	6	1	2	3	39	23.9	Crossing Intersection without Right-of-Way
-	3	1	-	-	5	3.1	On Sidewalk or Shoulder
-	-	-	-	-	3	1.8	Come From Behind Parked Car
2	1	2	-	1	14	8.6	Run Into Roadway
2	1	1	-	-	8	4.9	Cross Through Traffic
1	1	1	2	1	12	7.4	Other
10	20	22	17	14	163	100.0	Total
44.4	57.9	81.0	86.7	69.2	57.6		% Pedestrians Crossing or Walking with Right-of-Way (a)

PEDESTRIANS UNDER THE AGE OF 20 WERE MUCH MORE LIKELY TO BE INVOLVED IN A COLLISION WHILE CROSSING WITHOUT THE RIGHT-OF-WAY.

Exhibit 4-4

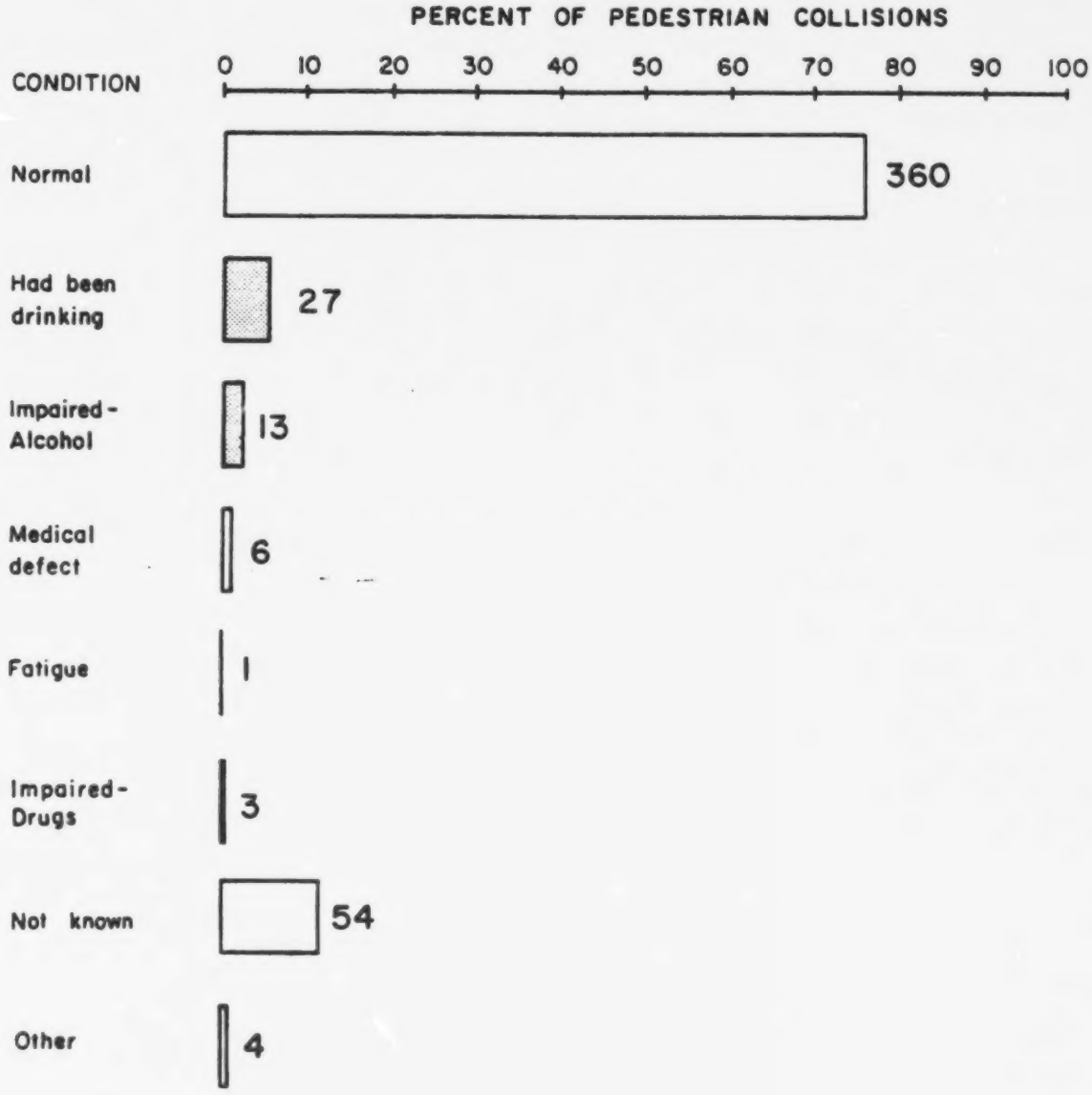
TIME OF DAY VS PEDESTRIAN AGE

Time of Day	0-4 Yrs	5-9 Yrs	10-14 Yrs	15-19 Yrs	20-24 Yrs	25-34 Yrs	35-44 Yrs	45-54 Yrs	55-64 Yrs	65-74 Yrs	75 + Yrs	Row Total
12 - 1 a.m.	-	-	1	1	2	4	1	1	1	-	-	11
1 - 2 a.m.	-	-	-	2	1	2	1	3	-	-	-	9
2 - 3 a.m.	-	-	-	1	1	1	-	-	-	-	-	3
3 - 4 a.m.	-	1	-	-	-	-	-	-	-	-	-	1
4 - 5 a.m.	-	-	-	-	-	-	-	-	-	-	-	-
5 - 6 a.m.	-	-	-	-	-	-	-	-	-	-	-	-
6 - 7 a.m.	-	-	-	-	1	2	-	-	-	-	-	3
7 - 8 a.m.	-	-	2	2	1	4	2	1	-	-	1	13
8 - 9 a.m.	-	8	6	4	-	2	1	-	1	1	4	27
9 - 10 a.m.	2	-	-	1	-	3	-	2	3	5	3	19
10 - 11 a.m.	1	3	-	2	-	1	1	2	3	4	4	21
11 - 12 noon	3	8	2	-	2	1	2	2	3	1	2	26
12 - 1 p.m.	3	7	8	4	-	1	2	4	6	1	3	39
1 - 2 p.m.	2	8	4	-	4	1	-	1	-	3	1	24
2 - 3 p.m.	2	4	1	3	2	6	1	3	5	3	3	33
3 - 4 p.m.	3	8	4	6	2	2	1	5	6	3	3	43
4 - 5 p.m.	1	15	11	7	-	1	2	4	3	4	2	50
5 - 6 p.m.	2	4	6	2	4	3	3	4	1	2	1	32
6 - 7 p.m.	1	3	5	1	2	2	1	6	1	-	1	23
7 - 8 p.m.	4	3	1	3	2	3	2	1	2	-	-	21
8 - 9 p.m.	-	-	4	5	2	4	-	2	1	-	2	20
9 - 10 p.m.	-	-	1	1	3	3	3	-	2	2	1	16
10 - 11 p.m.	-	-	2	2	4	2	1	-	2	1	1	15
11 - 12 a.m.	1	-	-	4	2	3	-	-	4	1	-	15
Total	25	72	58	51	35	51	24	41	44	31	32	464

27% OF PEDESTRIANS WERE INJURED IN COLLISIONS WHICH OCCURRED BETWEEN 3 P.M. AND 6 P.M.

NOTE: 4 pedestrian ages are not stated.

PEDESTRIAN CONDITION



8.5 PERCENT OF THE PEDESTRIANS INVOLVED IN COLLISIONS WERE IMPAIRED BY OR HAD BEEN DRINKING ALCOHOL.

Exhibit 4-6

PEDESTRIAN AGE VS TYPE OF TRAFFIC CONTROL

Type of Control	0 - 4	5 - 9	10 - 14	15 - 19	20 - 24	25 - 34	35 - 44
Traffic Signal	3	16	18	14	12	17	10
Stop Sign	4	6	8	13	7	8	4
School Guard	-	1	2	-	-	-	-
School Bus	-	1	2	-	-	-	-
No Control	18	48	28	21	16	26	10
Other	-	-	-	3	-	-	-
Totals	25	72	58	51	35	51	24
% Pedestrian Collisions at Midblock or Other Locations With No Control	72.0	66.7	48.3	41.2	45.7	51.0	41.7

(a) 4 pedestrian ages not stated.

45 - 54	55 - 64	65 - 74	75 +	Totals	(%)	Type of Control
20	22	17	14	163	(35.2)	Traffic Signal
5	8	3	4	70	(15.1)	Stop Sign
-	-	-	-	3	(0.6)	School Guard
-	-	-	-	3	(0.6)	School Bus
16	12	11	14	220	(47.4)	No Control
-	2	-	-	5	(1.1)	Other
41	44	31	32	464	(100.0)	Totals
39.0	27.3	35.5	43.8	47.4		% Pedestrian Collisions at Mid-Block or Other Locations With No Control

47% OF PEDESTRIAN COLLISIONS OCCURRED AT MID-BLOCK OR OTHER LOCATIONS WITH NO CONTROL.

FOR PEDESTRIANS UNDER 10 YEARS OF AGE 68% OR MORE WERE INVOLVED AT MID-BLOCK OR OTHER LOCATIONS WITH NO CONTROL.

Exhibit 4-7

DRIVER ACTION IN PEDESTRIAN COLLISIONS

Action	In Pedestrian Collisions	% Pedestrian Collisions
Driving Properly	262	58.4
Following Too Closely	1	0.2
Speed Too Fast	2	0.4
Improper Turn	5	1.1
Disobey Traffic Signal	6	1.3
Disobey Stop Sign	1	0.2
Fail to Yield Right-of-Way	56	12.5
Improper Passing	2	0.4
Wrong Way One-Way Street	1	0.2
Lost Control	6	1.4
Not Known	69	15.4
Other	34	7.6
Disobey Other Control	4	0.9
	449 (a)	100.0

58% OF THE MOTOR VEHICLE DRIVERS INVOLVED IN PEDESTRIAN COLLISIONS WERE RECORDED AS DRIVING PROPERLY.

THE MOST FREQUENTLY RECORDED IMPROPER DRIVER ACTION WAS FAILURE TO YIELD THE RIGHT-OF-WAY.

(a) Note - Pedestrian collisions involved more than one driver or vehicle in 12 cases. Data not available on driver action in 15 collisions.

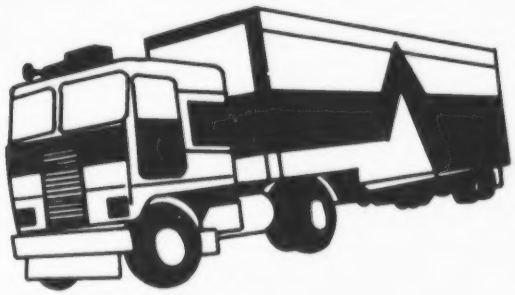
Exhibit 4-8

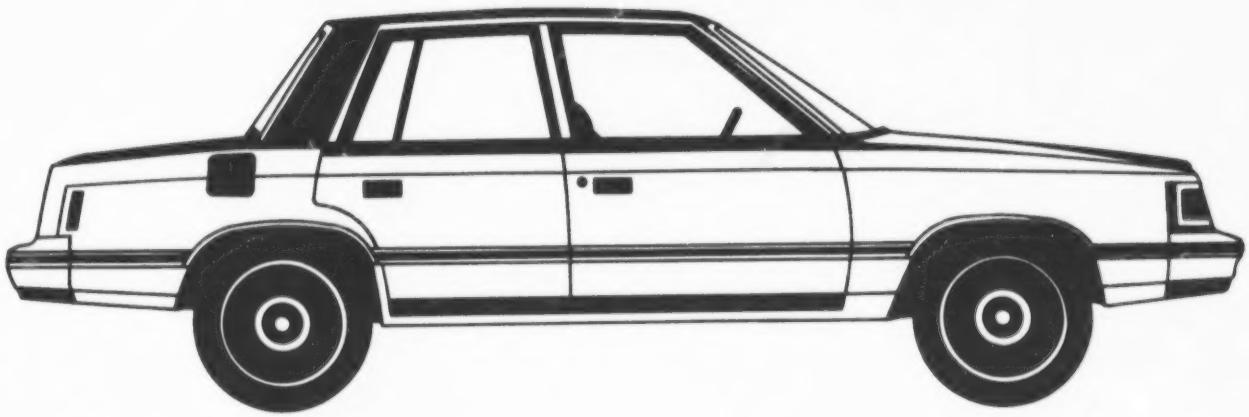
PEDESTRIAN AGE VERSUS INJURY STATUS

Pedestrian Age	Status of Inury					% Major or Fatal Injury
	Minimal	Minor	Major	Fatal	Total	
0 - 4	9	10	6	-	25	24.0
5 - 9	24	33	14	1	72	20.8
10 - 14	22	27	8	1	58	15.5
15 - 19	16	29	6	-	51	11.8
20 - 24	15	15	5	-	35	14.3
25 - 34	19	21	9	2	51	21.6
35 - 44	7	14	3	-	24	12.5
45 - 54	9	21	10	1	41	26.8
55 - 64	17	16	11	-	44	25.0
65 - 74	9	15	5	2	31	22.6
75 & Over	8	15	6	3	32	28.1
TOTAL	155	216	83	10	464	20.0
%	33.4	46.5	17.9	2.2	100.0	

EIGHTY PERCENT OF PEDESTRIANS INVOLVED IN COLLISIONS SUFFERED ONLY MINIMAL OR MINOR INJURIES.

PEDESTRIANS UNDER 5 YEARS OF AGE OR OVER 44 YEARS OF AGE WERE MOST LIKELY TO SUFFER SERIOUS INJURY IN A COLLISION.





Chapter Five
Vehicles

Vehicle Type

For drivers involved in collisions, the percentage of drivers driving properly was higher than average for conventional and school bus drivers (Exhibit 5-1). Caution should be exercised when interpreting this exhibit as there is no indication of vehicle exposure.

Vehicle Defects

Vehicle defects were recorded for 146 or less than 1 percent of the vehicles involved in 1981 collisions (Exhibit 5-2). The most frequently recorded defect was a poor or ineffective vehicle braking system. Although a vehicle defect was recorded, it does not necessarily follow that the defect was the proximate cause of the collision.

Exhibit 5-1

DRIVER ACTION VS VEHICLE TYPE

Driver Action	Non-motor Vehicle	Passenger Car	Car and Trailer	Truck	Truck and Semi	Truck and Trailer
Driving Properly	67	6,079	13	714	80	6
Follow Too Close	1	953	4	166	13	-
Speed Too Fast	5	242	-	24	3	-
Improper Turn	6	658	2	83	19	4
Disobey Traffic Signal	7	392	1	43	8	-
Disobey Stop Sign	13	235	-	29	1	-
Fail to Yield R.O.W.	18	1,328	1	166	16	-
Improper Passing	1	73	-	17	1	1
Lost Control	11	827	3	108	5	-
Wrong Way on One-Way	5	21	-	4	-	-
Not Known	17	999	2	135	16	1
Other	13	980	3	199	25	1
Disobey Other Control	2	54	-	14	-	-
Totals	166	12,841	29	1,702	187	13
% Involved Drivers Driving Properly (a)	(49.3)	(56.0)	(54.2)	(52.2)	(54.8)	(54.5)

FOR DRIVERS INVOLVED IN COLLISIONS, THE PERCENTAGE OF DRIVERS DRIVING PROPERLY WAS HIGHER THAN AVERAGE FOR DRIVERS OF CONVENTIONAL-TYPE BUSES AND SCHOOL BUSES.

(a) Excluding "not known" and "other".

Motor-Cycle	Bus	School Bus	Other	Totals	(%)	Driver Action
130	143	10	3	7,245	(47.2)	Driving Properly
12	3	2	-	1,154	(7.5)	Follow Too Close
11	-	-	-	285	(1.9)	Speed Too Fast
2	7	-	-	781	(5.1)	Improper Turn
4	1	-	-	456	(3.0)	Disobey Traffic Signal
1	1	-	-	280	(1.8)	Disobey Stop Sign
7	6	1	-	1,543	(10.0)	Fail to Yield R.O.W.
4	-	-	-	97	(0.6)	Improper Passing
19	2	-	-	975	(6.3)	Lost Control
-	-	-	-	30	(0.2)	Wrong Way on One-Way
13	11	-	1	1,195	(7.8)	Not Known
11	8	-	-	1,240	(8.1)	Other
2	1	-	-	73	(0.5)	Disobey Other Control
216	183	13	4	15,354	(100.0)	Totals
(67.7)	(87.2)	(76.9)	(100.0)	(56.1)		% Involved Drivers Driving Properly (a)

Exhibit 5-2

VEHICLE DEFECTS

Defect Type	Non Motor Vehicle	Passenger Cars	Car and Trailer	Truck	Truck and Trailer	Truck and Semi	Motor-Cycle	Bus	School Bus	Other	Totals	%
Brakes	3	33	-	11	-	-	-	-	-	-	47	32.2
Steering	-	11	-	-	-	-	1	-	-	-	12	8.2
Tire Puncture or Blowout	-	16	-	2	-	-	-	-	-	1	19	13.0
Tire Tread Insufficient	-	12	-	2	-	-	1	-	-	-	15	10.3
Headlamps Defective	1	2	-	1	-	-	-	-	-	-	4	2.7
Other Lamps or Reflectors Defective	-	15	-	5	-	2	-	-	-	-	22	15.1
Engine Control Defective	-	11	-	1	-	-	-	-	-	-	12	8.2
Wheels or Suspension Defective	1	-	-	2	-	1	-	1	-	-	5	3.4
Vision Obsured	-	3	-	3	-	-	-	-	-	-	6	4.1
Trailer Hitch Defective	-	1	2	-	1	-	-	-	-	-	4	2.8
Totals	5	104	2	27	1	3	2	1	-	1	146	100.0
Defective Vehicles as a % of all vehicles of the same type involved in collisions (a)												

DEFECTIVE BRAKES ACCOUNTED FOR 32.2% OF THE RECORDED DEFECTS.

(a) Does not include parked vehicles.

Chapter Six
Environment

Light Conditions

Exhibit 6-1 indicates that most collisions occurred under clear visibility conditions. Although poor light conditions can make driving difficult, collisions under these conditions are probably associated with drivers failing to adjust properly to changed conditions, particularly those associated with the roadway surface. Exhibit 6-2 indicates that 63 percent of the collisions occurred under daylight conditions.

Road Surface

An estimated 62 percent of collisions occurred under dry pavement conditions (Exhibit 6-3). The estimate is based on the 85 percent of cases where two roadway surface conditions were indicated on the collision report form.

Pavement Markings

In accordance with Exhibit 6-4, an estimated 80 percent of collisions occurred on marked roadways where the markings were visible. Similar to the road surface analysis, this estimate is based on collisions which had road conditions and markings reported for two roadways. In over 77 percent of the cases where the road markings were recorded as not visible or obscured, snow, slush, or ice conditions were also reported. It is important to note that pavement markings that are not visible to the driver are not necessarily associated with collision cause. Further analysis would be necessary to indicate whether or not there was a causal relationship.

Road Character

Exhibit 6-5 indicates that an estimated 66 percent of collisions occurred on two-way undivided roadways. There is no normalizing data available at this time which would serve to indicate that one type of road character was less prone to collision involvement than another.

As estimated 82 percent of collisions occurred on straight and level roadways where two roadways were reported on the collision report (Exhibit 6-6). Again, because exposure data and causation are not implied by the exhibit, caution should be exercised when interpreting this information.

Road Location and Traffic Control

Exhibit 6-7 indicates that the greatest number of collisions occurred at non-intersection locations. If the intersection-related and in-intersection categories are combined, there were a greater number of collisions directly or indirectly related to intersections. As the exposure to vehicle conflicts is inherently greater at intersection locations, this result is not unexpected. Exhibit 6-8 indicates that collisions occurring at signalized intersections have a slightly higher chance of resulting in serious injury than do collisions occurring at stop- or yield-controlled intersections, or locations with no control.

Exhibit 6-9 indicates that the measured point of impact of over one-half of all collisions was within 9 metres of the curb lines of an intersection. Twenty-two percent of collisions occurred at signalized intersections, and 13% of collisions occurred at intersections with no formal control.

Road Condition

An estimated 98 percent of roads were in good condition at the time of the collision (Exhibit 6-10). Although some roadways were under construction or under repair in the vicinity of the collision, this does not directly imply that road condition was a contributing cause of the collision.

Fixed Objects

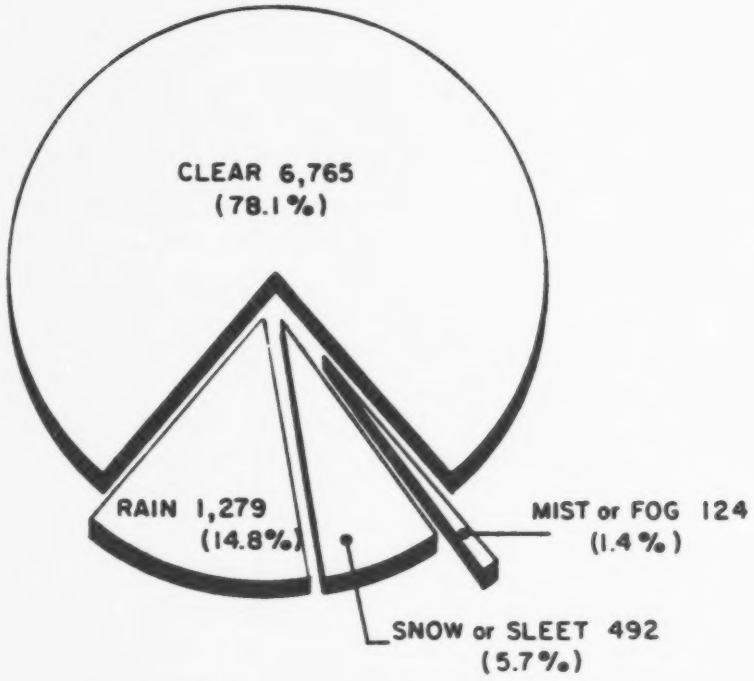
There were 1,407 recorded cases where vehicles struck fixed objects by the roadside (Exhibit 6-11). Thirty percent of the fixed objects struck by vehicles were rigid poles. In 76% of all fixed object collisions, a single motor vehicle left the roadway and struck a roadside object as its primary impact. In the remaining cases (24%), it would appear that the fixed object was struck after impact with another vehicle or pedestrian.

The chances of injury or death occurring were higher in collisions involving two or more vehicles in which a fixed object was struck than in single motor vehicle fixed object collisions. This may reflect the different nature of the types of collisions.

Twelve collisions in which a fixed object was struck resulted in fatalities. This frequency is approximately three times the rate of occurrence of fatalities in collisions in which no fixed object was involved.

Exhibit 6-1

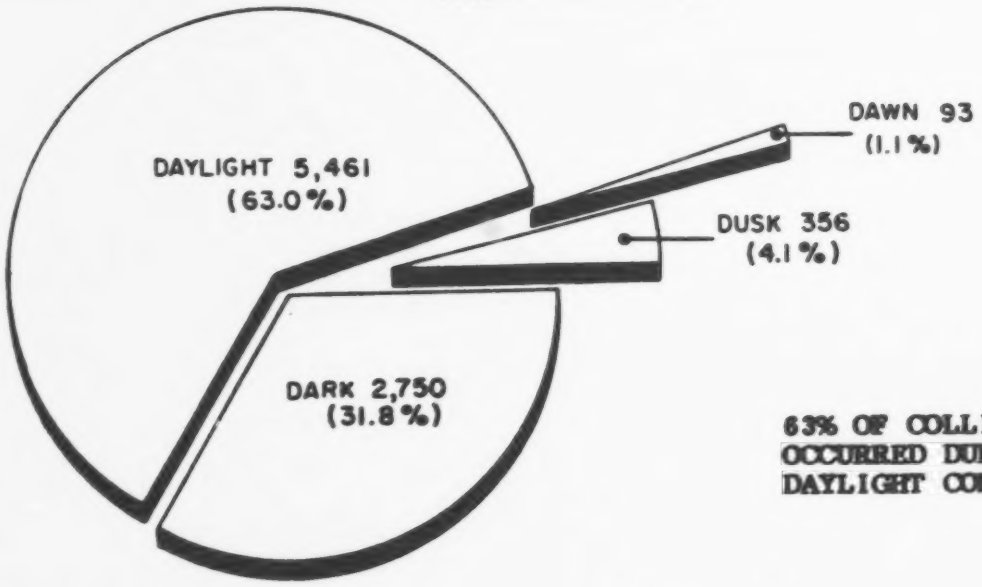
VISIBILITY CONDITIONS



78% OF COLLISIONS OCCURRED DURING CLEAR VISIBILITY CONDITIONS

Exhibit 6-2

LIGHT CONDITIONS



63% OF COLLISIONS OCCURRED DURING DAYLIGHT CONDITIONS

Exhibit 6-3

ROAD SURFACE CONDITIONS

ROAD 1 \ ROAD 2	DRY	WET	SNOW SLUSH ICE	GRAVEL MUD
DRY	4532			
WET	19	2244		
SNOW SLUSH ICE	10	49	498	
MUD GRAVEL	2	1	0	9

AN ESTIMATED (a) 62% OF COLLISIONS OCCURRED UNDER DRY PAVEMENT CONDITIONS.

Exhibit 6-4

ROAD 1 PAVEMENT MARKINGS VERSUS ROAD SURFACE CONDITIONS

SURFACE \ MARKINGS	GOOD	FAIR	NOT VISIBLE OBSCURED	NONE
DRY	4242	170	24	857
WET	2194	127	79	251
SNOW SLUSH ICE	167	15	354	158
MUD GRAVEL	2	3	2	15

AN ESTIMATED 80% OF COLLISIONS OCCURRED ON MARKED ROADWAYS WHERE THE MARKINGS WERE VISIBLE.

(a) IN 15% OF THE CASES, ROAD 2 INFORMATION WAS NOT RELEVANT AND WAS NOT RECORDED.

Exhibit 6-5

ROAD CHARACTER

ROAD 1

ROAD 2	ONE-WAY UNDIVIDED	TWO-WAY UNDIVIDED	DIVIDED BARRIER	DIVIDED	TRANSFER LANES RAMPS
ONE-WAY UNDIVIDED	1083				
TWO-WAY UNDIVIDED	796	4827			
DIVIDED BARRIER	40	80	111		
DIVIDED	64	175	3	164	
TRANSFER LANES RAMPS	1	5	9	2	5

AN ESTIMATED (a) 66% OF COLLISIONS OCCURRED AT THE INTERSECTIONS OF TWO-WAY UNDIVIDED ROADWAYS.

Exhibit 6-6

ROAD ALIGNMENT

ROAD 1

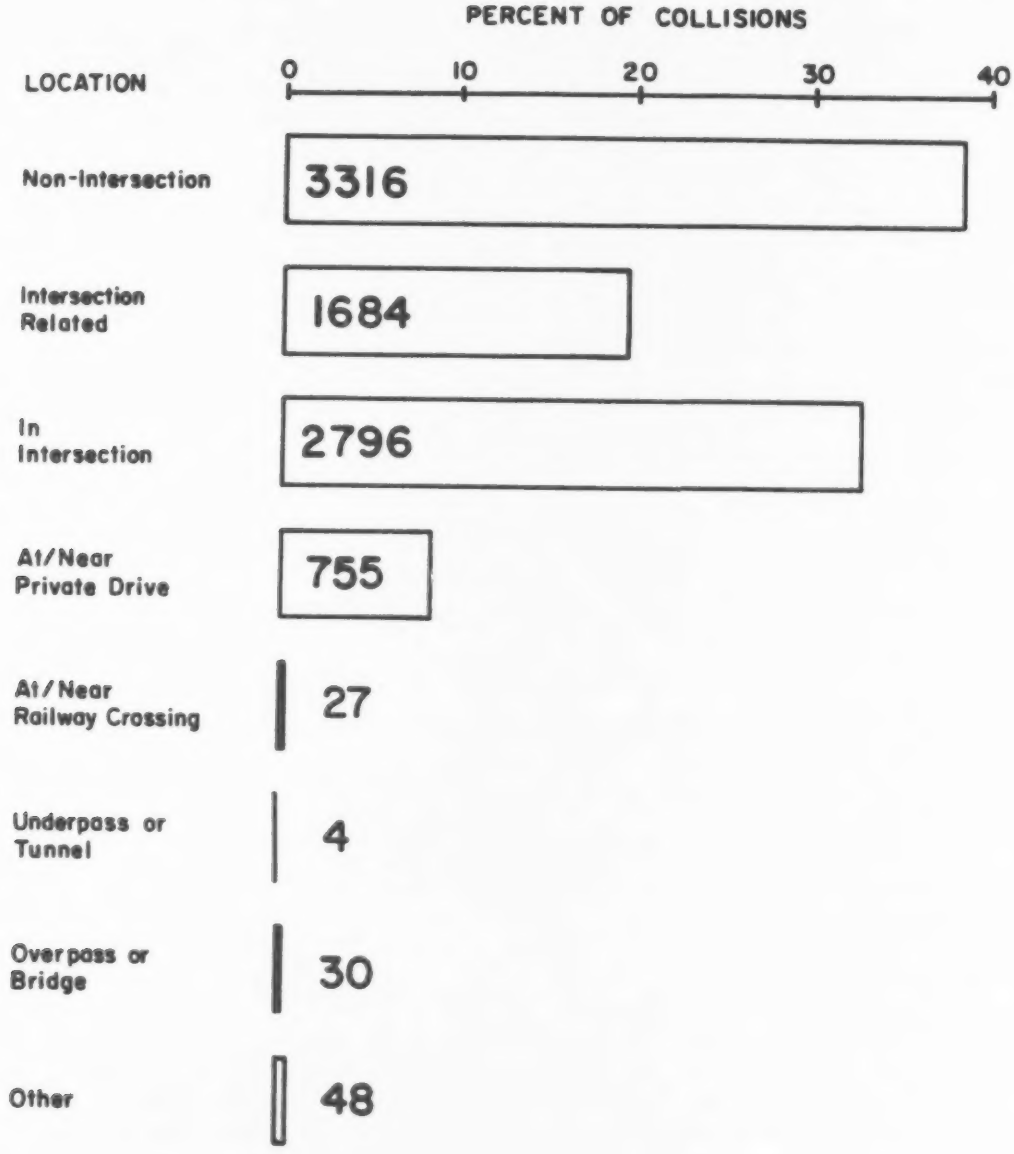
ROAD 2	STRAIGHT & LEVEL	STRAIGHT ON HILL	CURVE ON LEVEL	CURVE ON HILL
STRAIGHT & LEVEL	6135			
STRAIGHT ON HILL	394	270		
CURVE ON LEVEL	336	24	90	
CURVE ON HILL	101	46	10	99

AN ESTIMATED (a) 82% OF COLLISIONS OCCURRED ON STRAIGHT AND LEVEL ROADWAYS.

(a) IN 15% OF CASES, ROAD 2 INFORMATION WAS NOT RELEVANT AND WAS NOT RECORDED.

Exhibit 6-7

LOCATION OF COLLISIONS



48% OF COLLISIONS OCCURRED AT NON-INTERSECTION LOCATIONS

Exhibit 6-8

TRAFFIC CONTROL VS CLASS OF COLLISION

Traffic Control	Fatal Injury	Non-Fatal Injury	Property Damage Only	Totals	(%) Fatal or Injury Collisions
Traffic Signal	4	1,051	1,329	2,384	(44.2)
Stop Sign	2	620	967	1,589	(39.1)
Yield Sign	-	24	45	69	(37.8)
Police Control	-	1	2	3	(33.3)
School Guard	-	2	5	7	(28.6)
School Bus	-	3	3	6	(50.0)
No Control	21	1,670	2,855	4,546	(37.2)
Other	1	27	28	56	(50.0)
Totals	28	3,398	5,234	8,660	(39.6)

COLLISIONS OCCURRING AT SIGNALIZED INTERSECTIONS HAVE A SLIGHTLY HIGHER CHANCE OF RESULTING IN SERIOUS INJURY THAN DO COLLISIONS OCCURRING AT STOP- OR YIELD-CONTROLLED INTERSECTIONS, OR INTERSECTIONS WITH NO CONTROL.

Exhibit 6-9

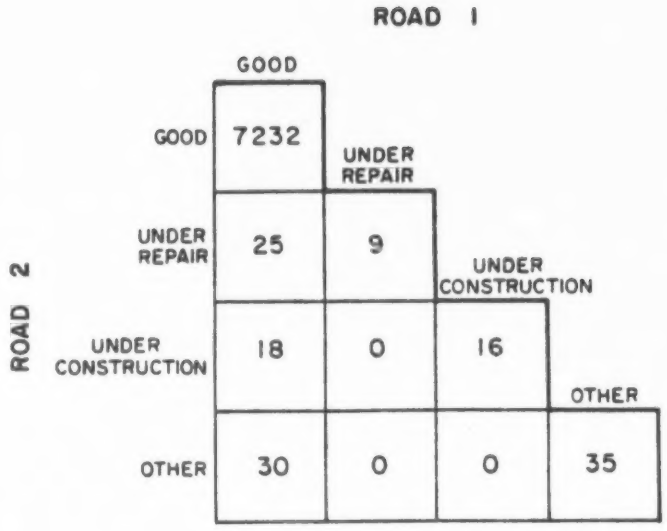
TRAFFIC CONTROL VS ROAD LOCATION

Distance From Intersection	Traffic Signal	Stop Sign	Yield Sign	Police Control	School Guard	School Bus	No Control	Other	Total	%
In Intersection (Within 9 Metres)	1,927	1,365	55	2	6	1	1,119	16	4,491	51.8
9.1 to 20 Metres	210	89	4	1	-	2	672	5	983	11.4
20.1 to 40 Metres	131	59	1	-	1	-	875	7	1,074	12.4
40.1 to 60 Metres	43	25	3	-	-	3	400	4	478	5.5
Over 60 Metres	73	51	6	-	-	-	1,480	24	1,634	18.9
	2,384	1,589	69	3	7	6	4,546	56	8,660	100.0

63% OF ALL COLLISIONS OCCUR WITH 20 METRES OF AN INTERSECTION.

22% OF ALL COLLISIONS OCCUR WITHIN SIGNALIZED INTERSECTIONS.

ROAD CONDITION



AN ESTIMATED (a) 98% OF ROADWAYS WERE IN GOOD CONDITION (I.E. NOT UNDER REPAIR OR UNDER CONSTRUCTION AT THE TIME OF THE COLLISION)

(a) IN 15% OF THE CASES, ROAD 2 INFORMATION WAS NOT RELEVANT AND WAS NOT RECORDED.

Exhibit 6-11

FIXED OBJECTS STRUCK VERSUS ROAD LOCATION

Object Struck	ROAD LOCATION Non-Intersection	Intesection Related	In Intersection	Private Drive	Railroad Crossing	Underpass or Tunnel	Overpass or Bridge	Other	Total	(%)	% Single Motor Vehicle
Restraining Barrier Rigid	75	22	10	-	-	1	4	6	118	(8.4)	79.7
Pole	236	82	83	19	1	-	1	2	424	(30.1)	75.7
Break-away Pole	50	15	19	4	-	-	1	1	90	(6.4)	73.3
Tree	79	17	12	6	-	-	-	-	114	(8.1)	80.7
Post (Sign; Parking Meter)	38	17	19	6	1	-	-	1	82	(5.8)	67.1
Fence	50	15	9	7	1	1	-	2	85	(6.0)	65.9
Culvert	13	2	2	3	-	-	-	-	20	(1.4)	95.0
Bridge Support	4	1	2	-	-	1	1	-	9	(0.7)	77.8
Rock Face	7	-	-	-	-	-	-	-	7	(0.5)	100.0
Snowbank or Drift	1	-	-	-	-	-	-	-	1	(0.1)	100.0
Ditch	94	15	19	6	-	-	1	-	135	(9.6)	90.4
Curb	54	20	24	6	-	-	1	3	108	(7.7)	57.4
Crash Cushion	2	2	-	-	-	-	-	-	4	(0.3)	75.0
Building or Wall	29	21	16	5	-	-	-	1	72	(5.1)	65.3
Other	84	24	19	5	1	-	2	3	138	(9.8)	79.7
Total	816	253	234	67	4	3	11	19	1,407	(100.0)	75.5

30% OF THE FIXED OBJECTS STRUCK BY VEHICLES WERE RIGID POLES.
76% OF COLLISIONS WITH FIXED OBJECTS WERE SINGLE MOTOR VEHICLE COLLISIONS.

Exhibit 6-12

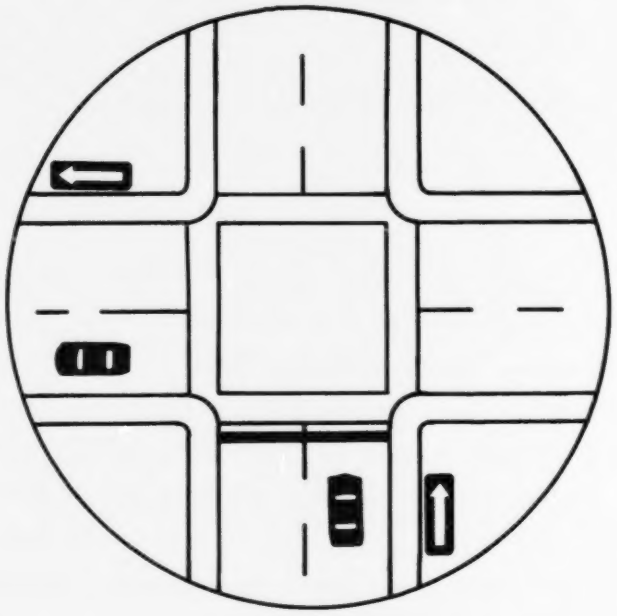
FIXED OBJECT VERSUS CLASS OF COLLISION

Object Struck	Fatal	Personal Injury	Property Damage Only	Total	% Fatal or Injury
Restraining Barrier	1	36	81	118	31.4
Rigid Pole	1	213	210	424	50.5
Breakaway Pole	-	42	48	90	46.7
Tree	4	53	57	114	50.0
Post, Sign, Parking Meter	1	30	51	82	37.8
Fence	1	31	53	85	49.4
Culvert	-	9	11	20	45.0
Bridge Support	-	7	2	9	77.8
Rock Face	-	1	6	7	14.3
Snowbank or Drift	-	-	1	1	-
Ditch	2	69	64	135	52.6
Curb	-	53	55	108	49.1
Crash Cushion	-	3	1	4	75.0
Building or Wall	-	32	40	72	44.4
Other	2	49	87	138	37.0
Total	12	628	767	1,407	45.5
Single Motor Vehicle Collisions	6 (0.6%)	436 (41.0%)	620 (58.4%)	1,062 (100.0%)	
Collisions Involving Two or More Vehicles	6 (1.7%)	192 (55.7%)	147 (42.6%)	345 (100.0%)	

THE PROBABILITY OF INJURY OR DEATH ARE HIGHEST IN COLLISIONS IN WHICH A RIGID POLE, BRIDGE SUPPORT, CURB, TREE OR CRASH CUSHION ARE HIT.

THE CHANCE OF INJURY OR DEATH IN A COLLISION IN WHICH A FIXED OBJECT IS HIT IS HIGHER WHEN TWO OR MORE VEHICLES ARE INVOLVED.

SIX SINGLE MOTOR VEHICLE COLLISIONS IN WHICH FIXED OBJECTS WERE STRUCK WERE FATAL.



Chapter Seven
Locations

General

Locations that have high numbers or rates of collision occurrences have received regular attention by roadway authorities in the Region and countermeasures are constantly being implemented on existing facilities and incorporated into the design of new facilities. However, physical alterations are not effective in preventing the majority of traffic collisions as these are the direct result of driver or pedestrian error.

Area Municipality

In general, the collision rate increased with increasing municipality size (Exhibit 7-1).

High Frequency Locations

Exhibit 7-2 represents a list of the 62 locations which experienced the highest number of collision occurrences in 1981. All 1981 collisions occurring at traffic signals were subjected to the control chart analysis technique (Exhibit 7-3). Additional information including collision data from previous years is included with this exhibit.

Exhibit 7-4 shows the relative number of collisions and collision rates for selected groups of signalized intersections.

These exhibits do not necessarily represent priority lists for improvements as other factors have to be taken into account such as cost-benefit considerations or the deployment of other countermeasure opportunities which may be more cost-effective.

In many cases, these locations are already under consideration for various forms of improvement on a priority basis.

Exhibit 7-1 **COLLISIONS VS AREA MUNICIPALITY**

Municipality	Class of Collision (a) Fatal	Non-Fatal Injury	Property Damage Only	All Collisions	1981 Collision Rate per 1,000 Pop. (b)
Ancaster	1	82	112	195	13.8
Dundas	-	92	209	301	15.6
Flamborough	-	125	165	290	12.1
Glanbrook	2	50	57	109	11.0
City of Hamilton	22	2,741	4,276	7,039	23.0
Stoney Creek	3	308	415	726	21.4
Total for the Regional Municipality of Hamilton-Wentworth	28	3,398	5,234	8,660	21.3

COLLISION RATE IN TERMS OF COLLISIONS PER 1,000 POPULATION GENERALLY INCREASED WITH INCREASED MUNICIPALITY SIZE.

(a) Collisions reported to the Hamilton-Wentworth Regional Police only; areas patrolled by the Provincial Police (e.g. Kings Highways) are not included.

(b) 1979 population figures used.

Exhibit 7-2

INTERSECTIONS WITH HIGHEST NUMBER OF COLLISIONS IN 1981 (a)

	Intersection	Type of Traffic Control	Number of Collisions	5 Yr. Avg.
1.	Main/Victoria	Traffic Signal	31	27.0
2.	Queenston/Centennial	Traffic Signal	26	27.0
3.	Fennell/Upper Sherman	Traffic Signal	21	19.0
4.	King/Victoria	Traffic Signal	21	16.6
5.	York/Dundurn	Traffic Signal	21	13.2
6.	Main/John	Traffic Signal	20	20.8
7.	Queensdale/Upper Gage	Traffic Signal	19	12.4
8.	Fennell/Upper Gage	Traffic Signal	18	19.2
9.	Main/Dundurn	Traffic Signal	18	19.2
10.	Mohawk/Upper James	Traffic Signal	18	13.6
11.	Aberdeen/Queen	Traffic Signal	17	10.4
12.	Barton/Ottawa	Traffic Signal	17	12.6
13.	Barton/Parkdale	Traffic Signal	17	16.0
14.	King/Centennial	Traffic Signal	17	15.2
15.	King/Dundurn	Traffic Signal	17	17.0
16.	Main/Wellington	Traffic Signal	17	15.8
17.	King/James	Traffic Signal	16	5.6
18.	Mohawk/Upper Paradise	Traffic Signal	16	12.2
19.	Queenston/Nash	Traffic Signal	16	19.6
20.	Queenston/Riverdale	Traffic Signal	16	9.7
21.	Barton/Centennial	Traffic Signal	15	19.8
22.	Barton/Gage	Traffic Signal	15	17.0
23.	Barton/Victoria	Traffic Signal	15	10.8

	Intersection	Type of Traffic Control	Number of Collisions	5 Yr. Avg.
24.	Fennell/Upper Ottawa	Traffic Signal	15	13.2
25.	York/Locke	Traffic Signal	15	9.8
26.	Hughson/Wilson[b]	2-Way Stop	14	9.6
27.	Burlington/Parkdale	Traffic Signal	14	16.8
28.	Charlton/Sherman	Traffic Signal	14	13.2
29.	Fennell/Garth	Traffic Signal	14	11.2
30.	Fennell/Upper James	Traffic Signal	14	9.6
31.	King/Queen	Traffic Signal	14	13.2
32.	Main/Bay	Traffic Signal	14	10.8
33.	Dunsmure/Kenilworth	2-Way Stop	13	15.2
34.	Aberdeen/Dundurn	Traffic Signal	13	10.6
35.	Barton/John	Traffic Signal	13	13.8
36.	Barton/Lottridge	Traffic Signal	13	8.6
37.	Barton/Woodward	Traffic Signal	13	6.6
38.	King/Wellington	Traffic Signal	13	10.6
39.	Main/Parkdale	Traffic Signal	13	7.2
40.	York/Queen	Traffic Signal	13	10.0
41.	Barton/Fruitland	2-Way Stop	12	7.0
42.	Catharine/Young	2-Way Stop	12	6.8
43.	Barton/Kenora	Traffic Signals	12	7.4
44.	Barton/Wentworth	Traffic Signal	12	9.2
45.	Cannon/Kenilworth	Traffic Signal	12	12.4
46.	Cannon/Ottawa	Traffic Signal	12	12.4
47.	Charlton/Queen	Traffic Signal	12	10.8
48.	King/Bay	Traffic Signal	12	11.8

	Intersection	Type of Traffic Control	Number of Collisions	5 Yr. Avg.
49.	Mohawk/Garth	Traffic Signal	12	18.0
50.	Mohawk/Upper Ottawa	Traffic Signal	12	13.4
51.	Balmoral/Main	2-Way Stop	11	12.4
52.	Barton/Robins	2-Way Stop	11	13.4
53.	Delawana/Centennial	Traffic Signal	11	9.4
54.	Fennell/Upper Wellington	Traffic Signal	11	12.0
55.	Fennell/Upper Wentworth	Traffic Signal	11	9.8
56.	Hunter/John	Traffic Signal	11	12.8
57.	King/Parkdale	Traffic Signal	11	14.6
58.	Limeridge/Upper James	Traffic Signal	11	12.4
59.	Main/Kenilworth	Traffic Signal	11	10.0
60.	Main/Locke	Traffic Signal	11	10.2
61.	Main/Longwood	Traffic Signal	11	10.6
62.	Rymal/Upper James	Traffic Signal	11	8.6

(a) Only collisions occurring within 31 feet (9.5 m) of the intersection are defined as beng "in" the intersection, and are included on this list.

(b) To be signalized in 1982.

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HAMILTON, ONTARIO

Exhibit 7-3

SIGNALIZED INTERSECTIONS WITH HIGHEST COLLISION RATES IN 1981 *

	Intersection	$\frac{R_1}{R_c}$	(a) R_1	(b) R_c	Number of Collisions 1980(c) AWDT	1981	1980	1979	1978	5 YR AVG.
1.	Queensdale/Upper Gage	2.33	3.04	1.31	17,900	19	15	10	5	12.4
2.	Fennell/Upper Sherman	1.85	2.28	1.23	28,800	21	12	17	22	19.0
3.	Fennell/Upper Gage	1.77	2.21	1.25	23,400	18	15	22	23	19.2
4.	Charlton/Sherman Access	1.74	2.28	1.31	18,900	14	20	8	14	13.2
5.	Main/Victoria	1.73	1.97	1.14	45,000	31	24	20	28	27.0
6.	Charlton/Queen	1.65	2.21	1.34	16,500	12	12	12	8	10.8
7.	Queenston/Riverdale(d)	1.60	2.02	1.26	24,300	16	6	7	5	9.7
8.	Fennell/Upper Ottawa	1.58	2.00	1.27	20,000	15	14	17	13	13.2
9.	Barton/John	1.55	2.02	1.30	17,500	13	15	20	11	13.8
10.	King/Victoria	1.47	1.73	1.18	38,000	21	15	14	13	16.6
11.	Mohawk/Upper Paradise	1.46	1.80	1.24	26,700	16	13	10	11	12.2
12.	Main/Parkdale	1.42	1.82	1.28	20,600	13	8	5	3	7.2
13.	Queenston/Centennial	1.42	1.61	1.13	44,800	26	29	26	22	27.0
14.	York/Dundurn	1.39	1.62	1.17	38,400	21	16	12	6	13.2
15.	Mohawk/Upper Ottawa	1.36	1.76	1.29	17,900	12	15	15	11	13.4
16.	Barton/Victoria	1.30	1.60	1.23	24,000	15	7	12	8	10.8
17.	Aberdeen/Queen	1.29	1.54	1.20	34,200	17	10	9	4	10.4
18.	Fennell/Upper Wentworth	1.29	1.67	1.30	18,500	11	9	12	9	9.8
19.	Aberdeen/Dundurn	1.20	1.48	1.24	25,504	13	12	7	12	10.6
20.	Cannon/Catharine	1.20	1.55	1.30	17,900	10	11	1	3	6.6
21.	Barton/Lottridge	1.19	1.47	1.24	26,900	13	8	7	6	8.6
22.	Barton/Ottawa	1.18	1.39	1.18	35,900	17	8	8	22	12.6

	Intersection	$\frac{R_1}{R_c}$	(a) R_1	(b) R_c	1980(c) AWDT	Number of Collisions 1981	1980	1979	1978	5 YR AVG.
23.	King/Centennial	1.16	1.36	1.17	35,500	17	15	20	14	15.2
24.	Main/John	1.15	1.31	1.14	43,100	20	26	23	13	20.8
25.	Mohawk/Upper James	1.14	1.33	1.16	34,400	18	11	15	12	13.6
26.	Queenston/Nash	1.14	1.35	1.18	33,500	16	26	23	17	19.6
27.	Governors/Ogilve (Dundas)	1.12	1.54	1.38	14,400	7	7	1	9	6.0
28.	Hunter/John	1.12	1.41	1.26	23,300	11	14	14	13	12.8
29.	Barton/Parkdale	1.10	1.28	1.16	39,400	17	14	13	12	16.0
30.	Barton/Wentworth	1.09	1.35	1.23	23,700	12	6	13	7	9.2
31.	King/New Mountain	1.09	1.46	1.34	15,600	8	4	4	2	3.6
32.	Limeridge/Upper James	1.09	1.37	1.26	24,400	11	5	13	17	12.4
33.	Britannia/Strathearn	1.08	1.44	1.33	16,700	8	7	9	3	6.6
34.	Fennell/Garth	1.08	1.30	1.20	31,000	14	10	8	8	11.2
35.	King/Cochrane	1.08	1.37	1.27	22,300	10	8	7	2	7.6
36.	Southbend/West 5th	1.08	1.43	1.33	19,100	8	5	9	3	5.4
37.	Cannon/Ottawa	1.07	1.31	1.23	26,700	12	8	12	19	12.4
38.	Barton/Gage	1.05	1.24	1.18	36,000	5	15	21	16	17.0
39.	King/James	1.05	1.44	1.36	13,300	7	8	8	1	5.6
40.	Hunter/Hess	1.04	1.52	1.46	8,500	5	12	11	7	8.2
41.	Beach/Gage	1.02	1.38	1.35	14,000	7	5	6	6	5.6
42.	StoneChurch/Upper James	1.00	1.25	1.26	22,100	10	5	11	13	9.8

NOTES:

(a) R_1 is the number of collisions per million vehicles entering occurring within 31 feet of an individual intersection in 1981.

(b) R_c is a volume-adjusted critical rate. If R_1 exceeds R_c ($\frac{R_1}{R_c}$ is greater than 1.00), one can state with 95 percent confidence that the collision rate at the intersection in question is significantly higher than would normally be expected.

$$R_c = R_a + K\sqrt{\frac{R_a}{m}} - \frac{0.5}{m}$$

where R_a = systemwide average collision rate for all traffic signal locations (0.80 collisions per million vehicle entries in 1981).

K = constant = 1.65 (for 95% confidence level)

m = vehicle exposure at the location in million vehicles entering per year (AADT x 365)

(c) AWDT - Average Weekday Daily Traffic; AADT - Average Annual Daily Traffic.

(d) Signalized in 1978.

(*) Note: Rates presented are for 1981 only. Rates may fluctuate significantly from year-to-year. Therefore, caution should be exercised when drawing conclusions from the above table.

Exhibit 7-4

OVERALL COLLISION RATES FOR SELECTED GROUPS OF SIGNALIZED INTERSECTIONS

Intersections Included	Avg. No. of Collisions Per Year	Rate (Collisions/ Million Vehicles Entering)
All intersections	6.66	0.80
Intersections of one-way streets with one-way streets	6.77	0.77
Intersections of one-way streets with two-way streets	5.36	0.64
Intersections of two-way streets with two-way streets	7.04	0.87
Central business district intersections	6.59	0.73
C.B.D. fringe or industrial intersections	6.10	0.72
Suburban shopping-type intersections	8.25	0.89
Residential area intersections	5.08	0.73
All lower city intersections	6.61	0.76
All mountain intersections	7.62	1.01

Appendix

Exhibit A-1

CAUSES OF DEATH (a) 1976

	Rate/100,000 Population	
	Canada	Ontario
Circulatory System	355.2	375.8
Neoplasms	153.1	154.4
Accidents, Poisonings, Violence (Including traffic accidents)	66.8	58.7
Respiratory System	51.3	49.0
Digestive System	27.2	27.5
Traffic Accidents	22.2	17.8
Endocrine, Nutritional & Metabolic	16.1	15.7
Perinatal	9.5	8.7
Ill Defined	9.5	8.1
Genito-Urinary System	8.4	8.0
Nervous System	7.9	7.1
Congenital Anomalies	6.9	6.2
Mental Disorders	4.7	5.9
Infective and Parasitic Diseases	4.4	3.7
Musculoskeletal System	2.5	2.4
Blood and Blood Forming Organs	2.2	2.0
Pregnancy Childbirth	0.5	0.6

(a) Statistics Canada, Vital Statistics, Volume III, 1976.

Exhibit A-2

ACCIDENTAL (a) CAUSES OF DEATH 1976

	Number		Death Rate/100,000	
	Canada	Ontario	Canada	Ontario
Traffic Accidents	5,110	1,470	22.2	17.8
Accidental Falls	1,820	671	7.9	8.1
Fires	765	266	3.3	3.2
Drowning	731	191	3.2	2.3
Industrial	672	208	2.9	2.5
Accidental Poisoning	526	205	2.3	2.5
Other Transport	520	164	2.3	2.0
Firearms	89	17	0.4	0.2
Motor Vehicle (non-traffic related)	62	26	0.3	0.3
All Other	956	314	4.2	3.8

(a) Statistics Canada, Vital Statistics, Volume III, 1976.

Exhibit A-3

ACCIDENTAL

CAUSES OF DEATH (a) 1976
(15 YRS. OF AGE AND UNDER)

	Number of Fatalities In Canada
Traffic Accidents	546
Drowning	225
Fires	167
Industrial	74
Accidental Falls	48
Other Transport	36
Firearms	28
Accidental Poisoning	22
Motor Vehicle (non-traffic related)	16
All Other	194

(a) Statistics Canada, Vital Statistics, Volume III, 1976.

Exhibit A-4

POPULATION AND REGISTRATION

Year	Population	Motor Vehicle Registration (a)		Ratio: Motor Vehicle Registration to Population
	Hamilton	Ontario	Hamilton	
1950	n/a	1,104,080	47,043	
1951	201,296	1,205.098	50,648	0.25
1952	210,060	1,291,753	55,169	
1953	216,921	1,406,119	59,808	
1954	222,907	1,489,980	62,728 (b)	
1955	225,608	1,617,853	67,497	
1956	233,019	1,710,240	70,034 (b)	0.30
1957	243,097	1,793,499	72,156	
1958	251,256	1,868,922	75,763	
1959	258,576	1,973,737	80,365	
1960	263,750	2,062,484	82,823	
1961	266,707	2,126,270	85,667	0.32
1962	268,908	2,177,148	83,779	
1963	264,706	2,268,320	89,005	
1964	278,260	2,381,219	93,208	
1965	283,099	2,516,680	102,171	
1966	285,649	2,643,474	107,506	0.38
1967	291,536	2,736,366	107,521	
1968	293,397	2,869,588	116,452	
1969	296,875	2,953,789	116,135	
1970	298,755	3,047,599	114,760	
1971	303,177	3,209,862	120,727	0.39
1972	304,391	3,382,497	134,623 (b)	
1973	305,382	3,583,379	140,687	
1974	401,932 (e)	3,891,603	154,886 (d)	
1975	408,466 (e)	4,079,108	162,348 (d)(g)	
1976	409,331 (e)	4,089,954 (c)	162,780 (d)	0.52 (f)
1977	411,358 (e)	4,274,410 (c)	170,122 (d)	
1978	407,486 (e)	n/a	n/a (h)	
1979	407,758 (e)	n/a	n/a	
1980	410,503 (e)	n/a	n/a	
1981	n/a	n/a	n/a	

NOTES:

(a) Registration is for all vehicles including automobiles, station wagons and commercial vehicles. Sources of data, Hamilton Police Reports, R. L. Polk and Company, Statistics Canada and The Ministry of Transportation and Communications of Ontario.

(b) Data not available. Estimated from provincial value.

(c) Estimated by the Ministry of Transportation and Communications.

(d) Data estimated from provincial value for City of Hamilton only.

(e) Population for Regional Municipality of Hamilton-Wentworth.

(f) For City of Hamilton only.

(g) R. L. Polk estimate for Region of Hamilton-Wentworth for 1975 - 180,084.

(h) Ministry of Transportation and Communications estimate for Region based on licence sales only, for 1978 - 176,576.

Exhibit A-5

MOTOR VEHICLE ACCIDENT DEATHS AND RATES

YEAR	DEATHS Canada	Ontario	Hamilton	RATES/10,000 REGISTERED MOTOR VEHICLES Canada	Ontario	Hamilton
1931	1,316	574	31	10.96	10.21	
1932	1,120	497	20	10.05	9.35	
1933	955	416	22	8.82	8.00	
1934	1,115	528	27	9.82	9.74	
1935	1,224	571	16	10.42	10.12	
1936	1,316	564	23	10.61	9.56	
1937	1,642	774	39	12.37	12.41	
1938	1,545	677	33	11.08	10.12	
1939	1,584	682	35	11.01	9.99	n/a
1940	1,723	756	46	11.46	10.74	
1941	1,852	835	45	11.78	11.30	
1942	1,409	610	49	9.24	8.53	
1943	1,437	563	41	9.51	8.14	
1944	1,374	526	28	9.14	7.79	
1945	1,556	637	25	10.39	9.61	
1946	1,781	729	33	10.98	10.25	
1947	1,869	753	26	10.17	9.41	
1948	2,086	782	19	10.25	8.94	5.34
1949	2,265	873	29	9.89	9.00	n/a
1950	2,270	850	12	8.74	7.70	2.55
1951	2,686	991	26	9.36	8.22	5.13
1952	2,701	1,040	26	8.56	8.05	4.71
1953	2,906	1,082	17	8.47	7.69	2.84
1954	1,960 (a)	1,045	17	5.38 (a)	7.01	2.71
1955	2,084 (a)	1,111	15	5.28 (a)	6.87	2.22
1956	3,184	1,180	25	7.46	6.90	3.57
1957	3,260	1,279	25	7.25	7.13	3.46
1958	3,118	1,112	21	6.61	5.94	2.77
1959	3,231	1,187	18	6.44	6.01	2.24

YEAR	DEATHS			RATES/10,000 REGISTERED MOTOR VEHICLES		
	Canada	Ontario	Hamilton	Canada	Ontario	Hamilton
1960	3,283	1,166	21	6.25	5.65	2.54
1961	3,426	1,286	19	6.21	6.05	2.22
1962	3,883	1,383	32	6.72	6.35	3.82
1963	4,210	1,421	27	6.93	6.26	3.03
1964	4,652	1,424	32	7.29	5.98	3.43
1965	4,902	1,611	27	7.31	6.40	2.64
1966	5,281	1,596	28	7.51	6.04	2.60
1967	5,429	1,719	39	7.26	6.28	3.63
1968	5,318	1,586	22	6.74	5.53	1.89
1969	5,425	1,683	19	6.57	5.70	1.64
1970	5,080	1,535	23	5.97	5.04	2.00
1971	5,573	1,769	23	6.17	5.51	1.91
1972	6,221	1,934	46	6.56	5.72	3.42
1973	6,706	1,959	23	6.60	5.47	1.63
1974 (b)	6,290	1,748	31	5.72	4.49	2.00
1975	6,061	1,800	26	5.29	4.41	1.60
1976			29			1.78
1977	n/a		34	n/a		2.00
1978			47			n/a
1979			42			n/a
1980			33			n/a
1981			31			n/a

(a) Except Quebec.

(b) Reporting area expanded to include new areas patrolled by the Hamilton-Wentworth Regional Police.

Exhibit A-6

HAMILTON/HAMILTON-WENTWORTH PEDESTRIAN INJURY RATES HISTORIC TRENDS

YEAR	PEDESTRIAN	
	Injuries Per 1,000 Population	Fatalities Per 100,000 Population
1951	1.41	7.45
1952	2.13	6.19
1953	2.14	4.14
1954	1.97	5.83
1955	2.29	3.10
1956	1.92	9.01
1957	2.16	6.17
1958	1.78	5.57
1959	1.76	5.03
1960	1.60	4.93
1961	1.96	4.12
1962	1.84	4.83
1963	2.11	5.67
1964	1.89	7.19
1965	2.05	6.00
1966	2.07	5.95
1967	1.89	5.83
1968	2.11	3.41
1969	2.03	2.02
1970	1.81	4.69
1971	1.84	4.29
1972	1.76	6.90
1973	1.87	2.95
1974 (a)	1.41	3.23
1975	1.28	2.69
1976	1.18	3.42
1977	1.22	2.43
1978	1.34	6.14
1979	1.14	3.68
1980	1.03	2.93
1981	1.13	2.46

Note: See also Exhibit 1-2

(a) Reporting area expanded to include new areas patrolled by the Hamilton-Wentworth Regional Police.

Exhibit A-7

TRENDS DATA
REGRESSION EQUATIONS

Statistic	Years	Equation (a)	Significant Slope at 95%	99% (b)	Range of Significant Slope at 95%
1. Collision Rate - All (c)	1951 - 1981	y = -0.107 x + 28.72	No	No	-0.337 to 0.124
2. Collision Rate - All (c)	1965 - 1981	y = -0.956 x + 35.03	No	No	-1.187 to -0.724
3. Injury Collision Rate	1954 - 1981	y = 0.123 x + 5.94	Yes	Yes	0.059 to 0.186
4. Injury Collision Rate	1965 - 1981	y = -0.115 x + 9.72	Yes	Yes	-0.188 to -0.042
5. Personal Injury Rate	1951 - 1981	y = 0.259 x + 5.93	Yes	Yes	0.181 to 0.338
6. Personal Injury Rate	1963 - 1981	y = -0.059 x + 12.80	No	No	-0.166 to 0.049
7. Pedestrian Injury Rate	1951 - 1981	y = -0.028 x + 2.19	Yes	Yes	-0.039 to -0.017
8. Fatality Rate - All Collisions	1951 - 1981	y = -0.044 x + 9.84	No	No	-0.142 to 0.055
9. Pedestrian Fatality Rate	1951 - 1981	y = -0.103 x + 6.44	Yes	Yes	-0.163 to -0.044

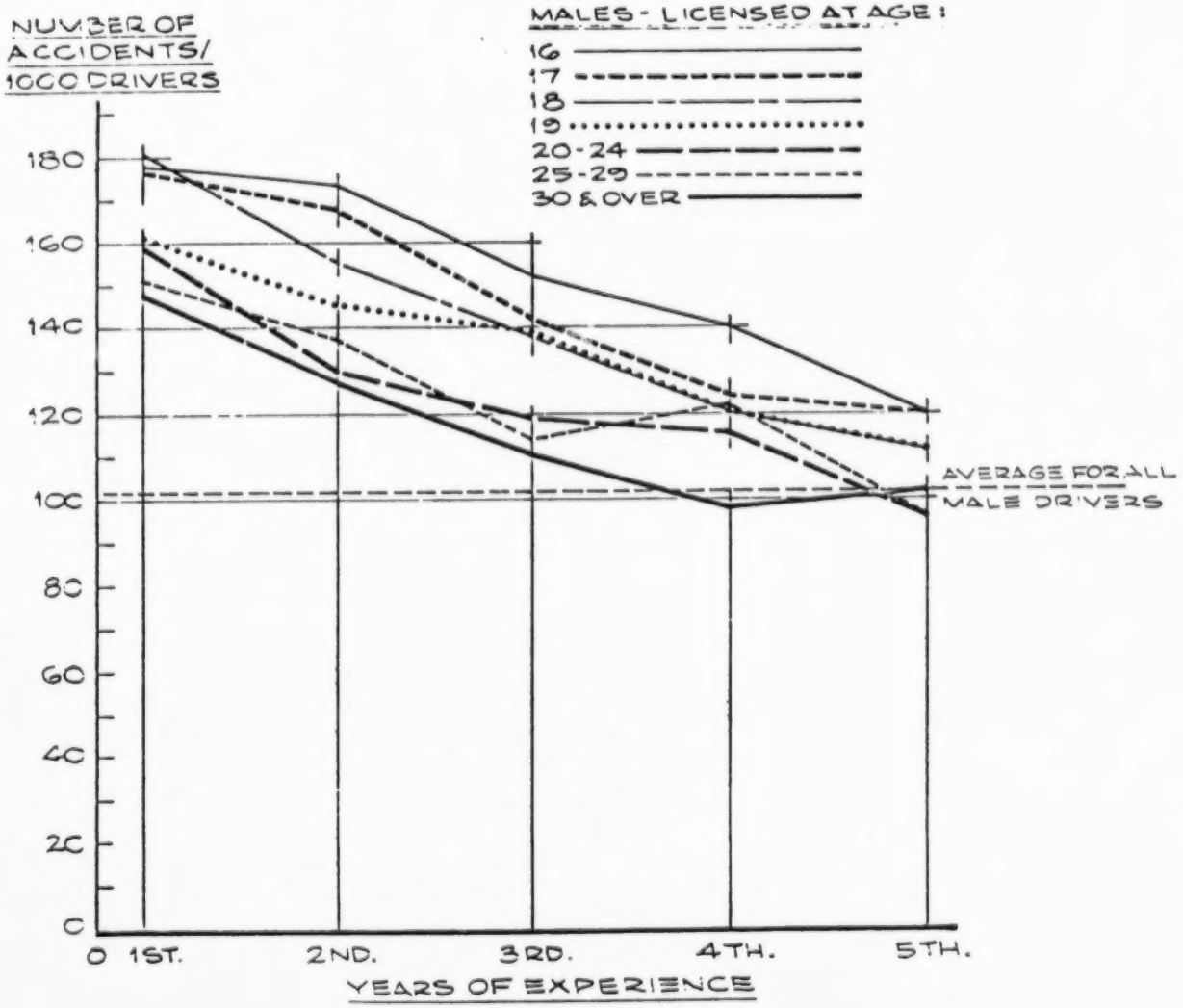
(a) The variable "x" represents the year; "y" the number of collisions expected.
"x" is 1.0 for the first year included in the equation.
"y" is in collisions per 1,000 population for 1 and 2; in injuries per 1,000 population for 3, 4 and 5; and in fatalities per 100,000 population in 6 and 7.

(b) If the slope of the regression line is significant, we can state with the indicated level of confidence that the slope is not equal to zero.

(c) Includes changes in reporting criteria and reporting area. For this reason, conclusions drawn from this regression line may not be entirely meaningful or appropriate.

Exhibit A-8

IT TAKES ABOUT FIVE YEARS FOR NEW DRIVERS TO REDUCE THEIR ACCIDENT RATE TO THE PROVINCIAL AVERAGE



SOURCE - SYSTEMS RESEARCH & DEVELOPMENT,
ONTARIO MINISTRY OF TRANSPORTATION & COMMUNICATIONS

Exhibit A-9

COLLISION STATISTICS - SELECTED CANADIAN CITIES

City or Regional Municipality	Population	Property Damage Only - Collision Reporting Level	Collision Reporting Criteria (1) (a)	(b)	(c)	(d)	Other	Total Collisions	Collisions/ 1,000 Population	Injury Collisions	Injury Collisions/ 1,000 Population
Regional Hamilton-Wentworth	407,000 (1981)	$400.00	No	No	Yes	Yes	(f)	8,660	21.3	3,426	8.4
City of Hamilton	307,000 (1981)	$400.00	No	No	Yes	Yes	(f)	7,039	22.9	2,763	9.0
Edmonton	521,205 (1981)	$350.00	No	No	No	Yes		34,464	66.1	5,341	10.3
Halifax	114,594 (1981)	$500.00	Yes	Yes	Yes	Yes		5,258	45.7	624	5.4
London	257,000 (1982)	$400.00	No	Yes	Yes	Yes		8,698	33.8	2,043	7.9
City of Montreal	1,020,900 (1981)	$250.00	No	No	Yes	Yes		26,585	26.1	7,041	6.9
Regional Ottawa-Carleton	546,849 (1981)	$400.00	No	No	No	Yes		13,504	24.7	3,580	6.5
Saskatoon	154,300 (1981)	$200.00	No	No	Yes	Yes		7,335	47.6	646	4.2
Metro Toronto	2,132,373 (1981)	$400.00	Yes	Yes	Yes	Yes	(e)	58,686	27.5	15,937	7.5
Vancouver	414,000 (1981)	$200.00	No	No	Yes	Yes		30,871	74.6	3,266	7.9
Windsor	196,500 (1981)	$400.00	Yes	Yes	Yes	Yes		4,629	23.5	1,655	8.4
Winnipeg	607,220 (1981)	$300.00	Yes	Yes	Yes	Yes		20,055	33.0	4,197	6.9
Burlington (2)	114,853 (1981)	$400.00	Yes	Yes	Yes	Yes		2,485	21.6	1,005	8.7
Calgary	605,000 (1981)	$500.00	Yes	Yes	Yes	Yes	(f)	43,121	71.3	2,545	4.2
Regina (3)	164,313 (1981)	$200.00	No	No	No	Yes		7,730	47.1	853	5.2

(1) KEY TO CRITERIA FOR REPORTING COLLISIONS (See next page for definition of injury collisions)

(a) Collisions reported involving an infraction of the Provincial Highway Traffic Act with property damage only and less than reporting level.
(b) Collisions reported involving an infraction of the Criminal Code of Canada with property damage only and less than reporting level.
(c) Hit and run collisions reported with property damage only and less than reporting level.
(d) Collision reported if it involves any personal injury.
(e) Public property damage collisions.
(f) Collisions involving City or Regional government vehicles.

(2) Total number of injuries reported as opposed to injury collisions.
(3) Only injuries requiring medical attention were classified as injury collisions.

DEFINITIONS OF "PERSONAL INJURY" (a)

Regional Hamilton-Wentworth	- any bodily harm, visible or complained of, that results from a motor vehicle collision.
City of Hamilton	- any bodily harm, visible or complained of, that results from a motor vehicle collision.
Edmonton	- includes minor abrasions and bruises, complaint of pain, caused by a motor vehicle collision.
Halifax	- injury or death (no stipulation regarding severity of injury) caused by a motor vehicle collision.
London	- any type of injury caused by a collision; need not be treated at a hospital.
City of Montreal	- any injury, apparent or not, to any person, caused directly or indirectly, by a motor vehicle.
Regional Ottawa-Carleton	- injury is any bodily harm visible or complaint of, caused by a motor vehicle collision.
Saskatoon	- any bodily harm, visible or complaint of, caused by a collision.
Metro Toronto	- injury must be reported when an injury occurs to any of the involved persons in a collision.
Vancouver	- up to descretion of driver or police if in attendance.
Windsor	- any injury resulting from a motor vehicle collision.
Winnipeg	- readily identifiable injury or perceived injury caused by a collision.
City of Burlington	- any bodily harm, visible or complained of, that results from a motor vehicle collision.
City of Calgary	- any type of injury resulting from a collision.
City of Regina	- any bodily harm, visible or complaint of, caused by the accident.

(a) definitions of a "personal injury" such that a collision involving a personal injury must be reported.

Exhibit A-10

FATAL COLLISION STATISTICS - CANADIAN AND U.S. CITIES (1)

CITY	# OF FATALITIES 1980	RATE PER 100,000 POPULATION	RATE PER 10,000 REGISTERED VEHICLES
HAMILTON (2)	22	7.4	1.3
AVERAGE OF ALL CANADIAN CITIES REPORTING TO N.S.C. (8 CITIES)	38.1	10.6	2.5
Calgary, Alta	56	16.9	3.8
Edmonton, Alta	52	13.8	3.2
Lethbridge, Alta	7	19.1	4.1
Medicine Hat, Alta	2	8.0	1.8
Vancouver, B.C.	60	14.6	2.4
London, Ont.	22	11.3	3.0
Montreal, Que.	84	6.9	2.1
AVERAGE OF ALL U.S. CITIES, POPULATION 200,000 - 350,000 REPORTING TO N.S.C. (17 CITIES)	36.1	14.2	2.0
Birmingham, Ala.	38	13.6	1.8
Mobile, Ala.	32	15.4	2.9
Anchorage, Alas.	24	11.9	1.3
Tucson, Ariz.	95	28.7	4.4
Anaheim, Cal.	22	10.6	1.3
Oakland, Cal.	34	10.0	1.7
Colorado Sprgs, Colo.	28	13.5	1.8
Tampa, Fla.	38	14.4	1.6
Wichita, Kans.	44	16.4	2.0
Baton Rouge, La.	35	11.3	2.5
Shreveport, La.	26	12.9	1.8
Albuquerque, N.M.	50	16.9	2.1
Rochester, N.Y.	18	7.5	1.0

CITY	# OF FATALITIES 1980	RATE PER 100,000 POPULATION	RATE PER 10,000 REGISTERED VEHICLES
Austin, Tex.	51	16.0	2.0
Corpus Christi, Tex.	41	19.1	2.6
Richmond, Va.	9	4.1	0.6
Virginia Beach, Va.	29	11.8	2.0

NOTE:

(1) SOURCE: Accident Facts, 1981 Edition, National Safety Council, 444 N. Michigan Avenue, Chicago, Ill. Please note statistics are for 1980 calendar year.

(2) Rate is for City of Hamilton only.